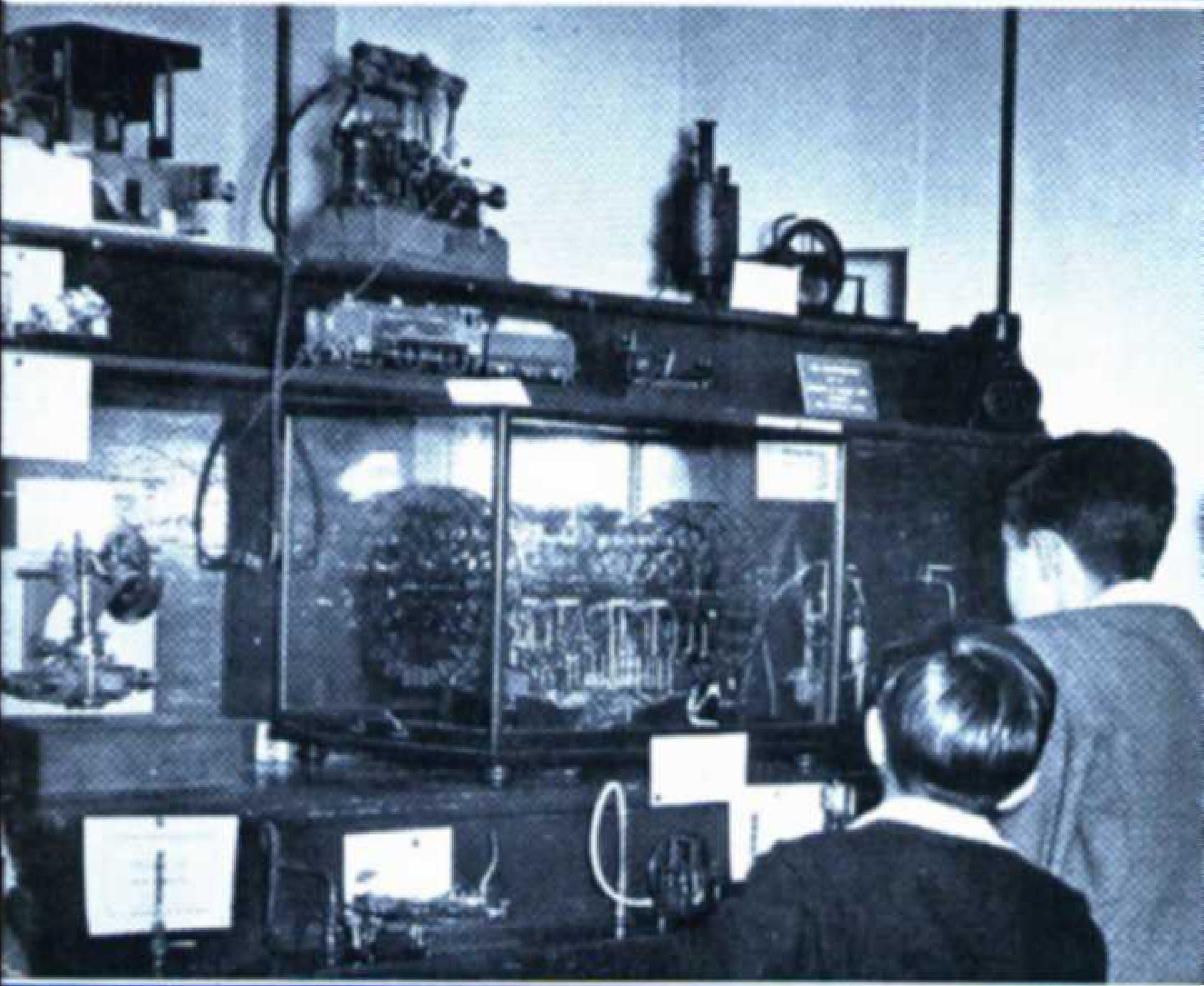
THE MODEL ENGINEER



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THE MODEL ENGINEER

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Our Cover Picture

As usual at the "M.E." Exhibition, the Society of Model and Experimental Engineers had a most attractive stand displaying numerous excellent examples of the work of past and present members. The variety was very striking, ranging from a simple steam pump to some extremely elaborate and very beautifully constructed marine engines. Many of the models were connected to a pipe-line, supplied with air from a compressor, and were seen in motion. Such a stand is always a great attraction to visitors, and our cover picture depicts just one corner where a splendid model of a fine old paddle engine seems to be holding the enthralled attention of a family. There were several examples of models on view in course of construction.

SMOKE RINGS

An Afterthought

OPINIONS CONCERNING the "M.E." Exhibition are always interesting and frequently instructive to our Exhibition Manager and his staff; they vary widely, but each is given careful consideration, especially those containing suggestions that may possibly lead to future improvements. However, there are a few people who seem to think that the "M.E." Exhibition should be devoted entirely to displaying models, and the trade stands should be either excluded or, at least, drastically reduced in number. We have commented before on this idea and we had thought that we had made it clear that the idea is, frankly, impossible if the expenses are to be met. But that aspect of it is rather beside the point because, from the model engineering angle, there are more important matters to be taken into account.

Visitors to the "M.E." Exhibition do not come only from Britain; many of them come from other countries, some of them making special efforts and incurring considerable expense to make the journey. These people expect to find not only a display of the work of our model engineers, but also facilities for seeing and inspecting products of our manufacturers and dealers who cater for our hobby in all its various aspects and allied crafts. The benefits derived from the arrangements made to meet this demand can extend to *all* our visitors; in their own way, they are similar to those applying to any of the engineering exhibitions which attract enthusiasts, as well as buyers and sellers, from anywhere. After all, our hobby has steadily built up its own trade; therefore, our traders have as much right as anyone else to a share in whatever benefits the "M.E." Exhibition has to offer, and to exclude the trade stands would be an act of selfishness that could hardly fail to arouse the strongest disapproval.

Foot-power at 70

IN A recent letter from Mr. J. E. Reid, of Scarborough, he pays a graceful tribute to THE MODEL ENGINEER by saying that he is a lone hand and has enjoyed the journal since the early days. He goes on: "Now over 70, I still enjoy and appreciate the paper. I may add that I have about completed the making of a 3½-in. lathe on stand with treadle for my enjoyment in these days of more leisure. Thanks for all I owe to THE MODEL ENGINEER and its staff, not forgetting the tonic 'L.B.S.C.'"

In acknowledging this compliment with all due gratitude, we express the hope that Mr. Reed may enjoy many years of pleasure with his lathe, more especially because we admire the courage and determination that have enabled Mr. Reed to undertake the construction of a lathe, at his age. We are afraid that we know many a younger man who, if he made a lathe at all, would see that it was power-driven! There are few who would tolerate a treadle lathe today.

Glasgow S.M.E. Second Exhibition

WE HAVE been advised that the second Scottish Model Engineering Exhibition, organised by the Glasgow S.M.E., will be held in the Christian Institute, 70, Bothwell Street, Glasgow, from November 28th to December 5th, excepting the Sunday. There will be the usual Competition and Loan sections, entry forms for which are now available from the Hon. Sec.: Mr. R. SUTHERLAND, 66, Wellmeadow Road, Pollokshaws, Glasgow, S.3. The entry fee for the Competition section will be 2s. 6d. for adults, and there will be no entry fee for juniors under the age of 18.

The exhibition, which is to be opened by the Lord Provost of Glasgow, will be open to the public from 10 a.m. to 10 p.m. daily, with the exception of Saturday 28th, when it will be open at 10.30 a.m.

LOCOMOTIVES

at the "M.E." Exhibition

By J. N. Maskelyne

WITH only ten months since the 1952 "M.E." Exhibition, there was little cause for surprise at the drop in the number of locomotive models entered this year; it was only to be expected. But the very marked lowering of the general standard of workmanship in this section came as rather a shock to those of us who had to judge them.

No entry succeeded in winning the Locomotive Championship Cup this year, and for the simple reason that there was no entry that reached the required standard of all-round excellence.

Incidentally, there was some criticism of the judges' decision on this matter, but I would point out that the judges reserve the right to modify any of the general regulations governing the awards, when circumstances justify it.

The best locomotive this year was the 5-in. gauge Southern Railway L1-class 4-4-0 by R. K. Boardman of Sudbury. It was well made and nicely finished; but there were some curious little errors on it, especially in the lettering. Apparently, there are people who have already forgotten that the lettering on Southern Railway locomotives was yellow, not white.

A more serious fault in Mr. Boardman's engine was the varying thicknesses of the tyres of the wheels; those of the bogie wheels were rather too thin, while those on the four coupled wheels were about right and those on the tender were quite unnecessarily clumsy, an effect that was made to look worse than it might have done, because there had been no attempt to represent the tyres. A reversing-lever almost in the middle of the cab floor spoilt the otherwise neat and convenient arrangement of the cab-fittings. The platework could have been better by being flatter, but much of its uneven surfaces could be greatly improved by the use of paint fillers before the paint is put on.

From the constructional point of view, however, this engine is a fine job well worth the bronze medal it gained.

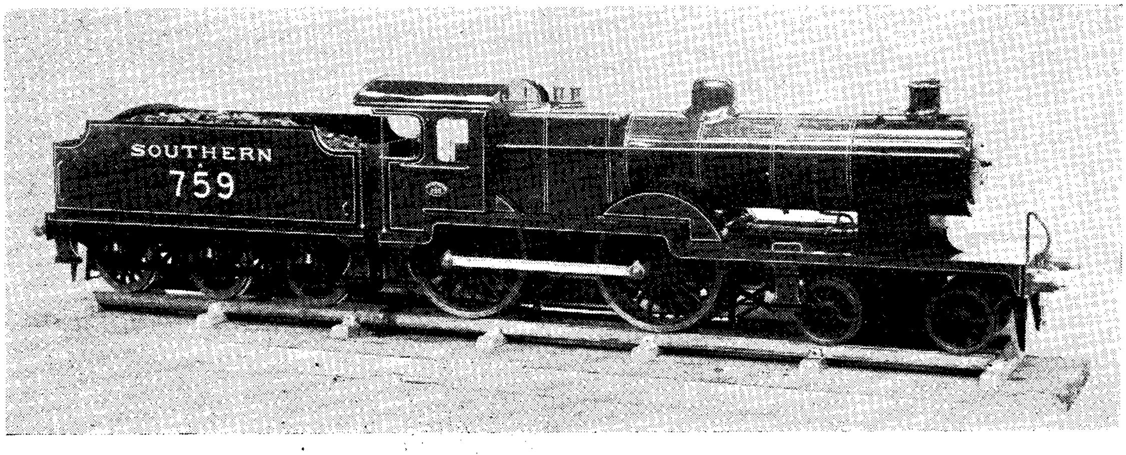
Realistic Appearance

Second on the prize-winning list came the 3½-in. gauge L.M.S.R. Class "5" 4-6-0 engine by Mr. L. J. Taylor of Enfield. Based on the very popular *Doris* by "L.B.S.C." this engine had clearly been built carefully to the published instructions; but Mr. Taylor had made certain detail modifications to achieve a definitely realistic appearance without upsetting the working capabilities of his engine. The workmanship throughout was of excellent, if not outstanding quality; neatness and care were evident in every detail; and with it all, there was a satisfying squareness and robustness without any tendency to clumsiness. The V.H.C. diploma was well merited in this case.

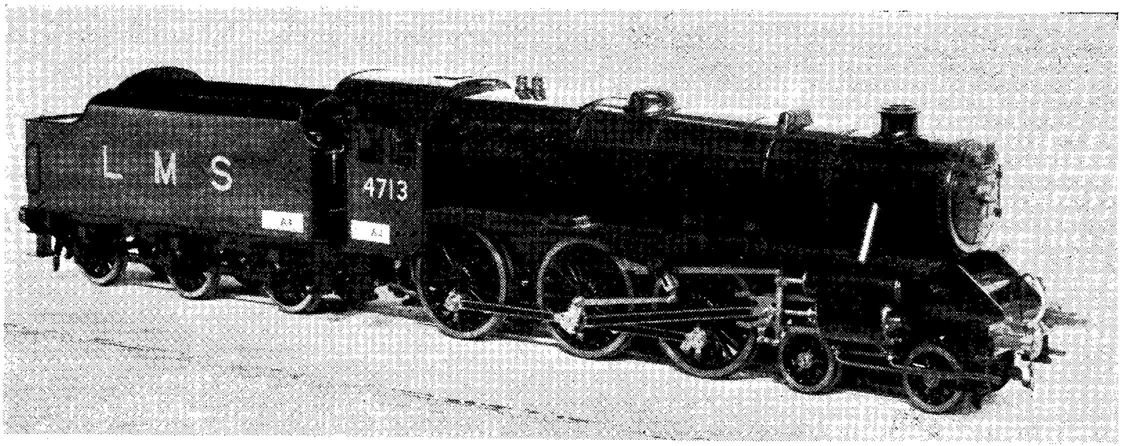
Third place with an H.C. diploma, was gained by Mr. T. Annells of Shoreham with his 3½-in. gauge *Pamela*-type locomotive. Here again was a nice job; in fact, it tied with Mr. Taylor's in all respects except the finish. The latter was comparatively poor, though nobody could describe it as definitely bad. I would like to suggest that with a properly ground ruling-pen and paint of a thinner consistency, the fine lining attempted on this model would have been more successful. The engine had obviously done a good deal of work, in spite of which the fit of all its mechanical parts was still very good, proving that care had been taken during construction.

Study the Prototype

Of the runners-up in this class, the best was the 3½-in. gauge



Mr. R. K. Boardman's 5-in. gauge S.R. 4-4-0 *locomotive*



A $3\frac{1}{2}$*-in. gauge L.M.S. Class* " 5 " 4-6-0 *locomotive by Mr. L. J. Taylor*

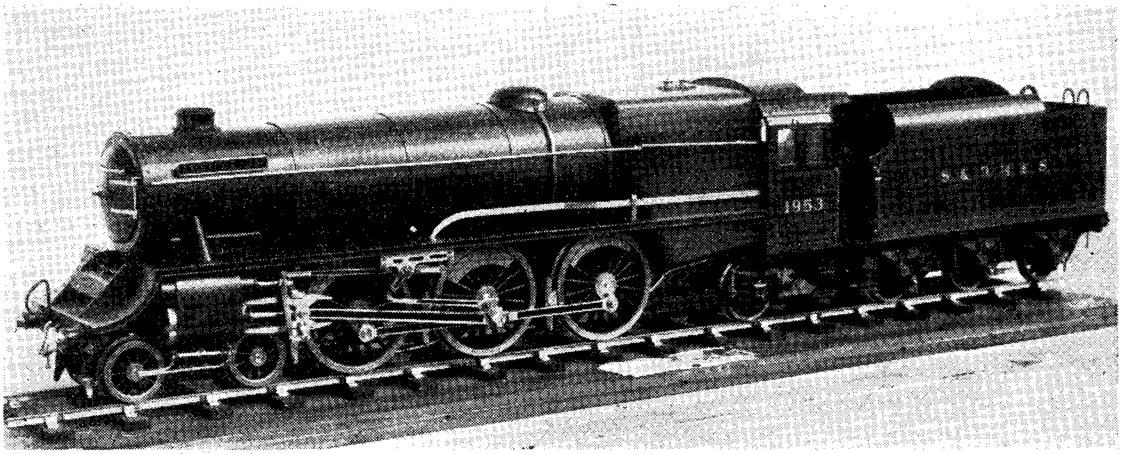
L.M.S.R. Class " 5 " 4-6-0 engine by Mr. F. C. Cook of Southall. This engine was similar to Mr. Taylor's but gave the impression that Mr. Cook had attempted a little too much and had not given enough study to the prototype he was copying. Sliding cab-windows with real glass in them are very nice and add an unexpected touch of realism; but Mr. Cook had made their frames unnecessarily over-size, and called instant attention to this by plating and polishing them !

The $2\frac{1}{2}$-in. gauge *Fayette*-type engine *Elmu*, by Mr. R. H. Drummond of Etwall, appeared at first sight to be a first-class piece of work; but, on close inspection, it was disappointing. Its chief fault is the " instrument " finish, or mottling, put on the whole of the footplating, the framing and even on the wheels ! Presumably, this was done to offset the lack of painting; but it is inappropriate to locomotive work, and only succeeds in producing an incongruous effect. There has been considerable trouble in bending the blue steel (Russian iron) sheeting on the boiler of this engine, resulting in unsightly blemishes that could have been made less obtrusive by a little judicious touching out with suitably coloured paint. The boiler mountings, while nicely made, were very unrealistic.

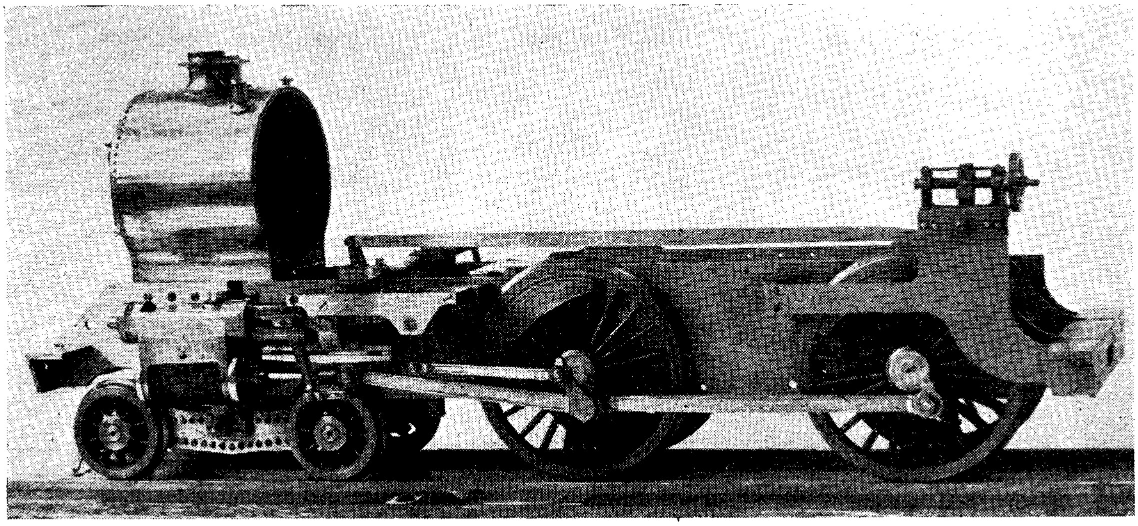
Surprise !

There was an exhibit in the Junior section that surprised us; it was the chassis and smokebox for a Southern Railway " Schools "-class 4-4-0 engine, made by Master D. B. G. Merrick of Headington, Oxford, aged $15\frac{1}{2}$. Full of promise, as far as it has gone, this bids fair to be a very fine job when it is finished. All three cylinders are included together with their necessary valve-gear; the workmanship is excellent, and there are no sloppy fits anywhere on it. The only questionable feature that we judges could find was the position of the oil-box for the mechanical lubricator, which will be extremely difficult of access when the boiler is in place. The Reeves prize was awarded to Master Merrick in the hope that it will encourage him to maintain the high standard he has evidently set himself in spite of difficulties.

The road locomotives were only three in number, this year, and the best of the three was the 1-in. scale



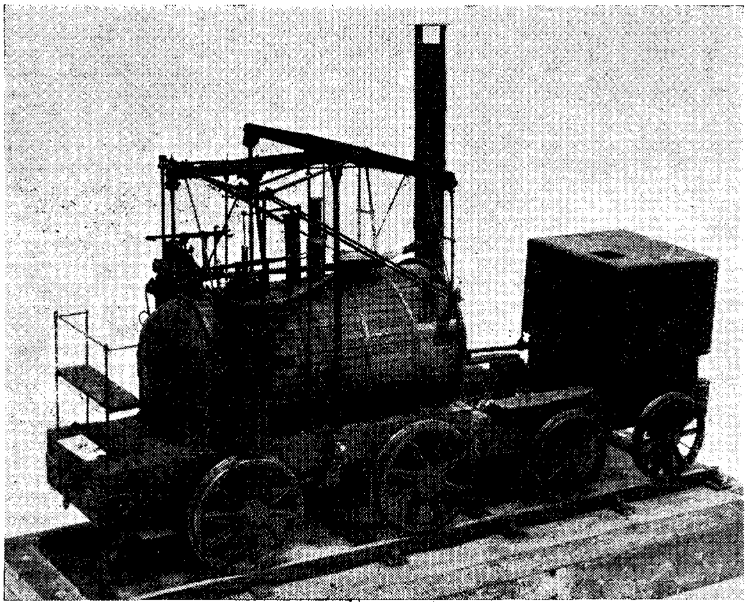
Mr. T. Annell's $3\frac{1}{2}$*-in. gauge " rebuilt " S.R. Pacific locomotive*



The work of a lad of 15. *The* $3\frac{1}{2}$*-in. gauge S.R.* " *Schools* " *chassis by Master D. B. G. Merrick*

traction engine by Mr. J. Wallace of Stagsden. This pleasing little engine, based on the ever-popular 1-in. scale " M.E." traction engine, had several details added, which enhanced its realism. It was nicely finished throughout and its boiler fittings had been neatly arranged; it won an H.C. diploma.

The $1\frac{1}{2}$-in. scale free-lance traction engine by Mr. W. D. Urwick of Taplow was, of course, larger than Mr. Wallace's, but lacked the latter's little touches of realism. None-the-less, it was a well-proportioned and handsome engine, far removed from the monstrosities that are so often produced by the " free-lance " fraternity ! Mr. Urwick has an eye for proportion as well as a sound constructive ability, and there can be little doubt that his engine will give good performance for years. A " C " diploma was awarded to him.



Hedley's " *Puffing Billy* " *to* 1*-in. scale by Mr. J. S. Youngman. An outstanding piece of pure craftsmanship*

In the General Craftsmanship class, there was the extremely fascinating 1-in. scale replica of Hedley's *Puffing Billy*, by Mr. J. S. Youngman of Chichester. Every detail on this engine is an exact copy of the prototype, even to representing faithfully the aged appearance, and showed that something approaching infinite care and patience had been put into the construction. The judges decided to award the Bradbury Winter Memorial Cup to this exhibit, because of the very high degree of craftsmanship displayed. The model was not arranged to work under its own power, but, by turning a handle in the base, the wheels and the complicated system of rods, levers and other moving parts could be set in motion.

As usual, the passenger-carrying track of the Society of Model and Experimental Engineers was a major attraction, and all the locomotives rostered to operate the traffic did so in their characteristic trouble-free manner. Throughout the run of the exhibition there was always an engine at work, and so far as is known, there was not a single mishap. I pay my small tribute to the untiring efforts of all who were responsible, once more, for the splendid results achieved.

MODELS IN WOOD
at the "M.E." Exhibition
By J. C. Anderson

THE finest examples of craftsmanship in wood were undoubtedly to be found in the Model Ships section. This is understandable, perhaps, since prototypes in the form of old-time sail ships always serve as an inspiration to portray the beauty and character of a timbered hull in the same medium as the original.

An excellent example of this kind of work was the ½-in. scale model of H.M.S. *Victory* by N. H. Macleod, where so much care had been taken in portraying the attractive detail of the high stern and quarter galleries. Again, at the bow, original detail had been followed with accuracy.

The outstanding workmanship in this model was by no means confined to the woodwork, however, for the rigging (ship modellers will know how extensive is the rigging of H.M.S. *Victory*) was a masterpiece in itself, and must have demanded infinite patience to execute in all its complexity.

The finished model was mounted on a base of oak taken from the original ship at Portsmouth, which helped to emphasise the character of the piece. It was awarded the Championship Cup for its class.

Apart from D. McNarry's waterline model of S.S. *Scot* (scale 50 ft. to 1 in) which deservedly won a silver medal, there were three excellent miniatures by G. H. Draper (also awarded a silver medal). The model of the 30 ft. gig for H.M.S. *Thunderer* for instance, was only about 7 in. or 8 in. long, and if D. McNarry's *Scot* was remarkable for its grace of line and the detail of its lifeboats (these were only about ⅝ in. long), Mr. Draper's models were remarkable for the delicacy of details such as ribs and gratings. He uses strips of bristol board for his planks, which achieves the effect of a painted clinker hull most convincingly. Incidentally his method of making miniature gratings is interesting from the point of view of its precision. They are made from plywood which is sometimes as thin as 25-thous. or 30-thous. of-an-inch—with holes punched as close together as 32 to the inch. Obviously, punching holes to this scale demands a precision instrument, and the one used by Mr. Draper consists of a metal plate with a miniature punch attached, operated by a hand lever.

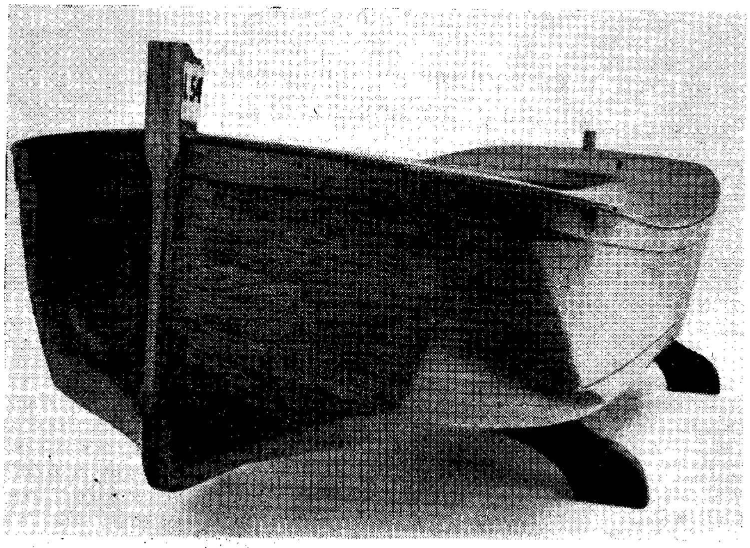
Fig. 3 shows the plate, which has holes drilled in it as shown, to take metal pegs. A thin metal guide (*D*, Fig. 4) is used to position the plywood, the guide resting against metal pegs *A*, *B* and *C*. If 20 holes to the inch are required in the plywood, the metal pegs are operated in the outer rows of holes (see Fig. 3). Pegs *B* and *C* remain stationary, whilst *A* is moved one hole further along in the metal baseplate after each hole is punched in the plywood, thus shifting the metal guide and plywood into the exact position for the next hole to be punched. Once the wood has been completely traversed, pegs *B* and *C* are both shifted down to their next holes, thus bringing the wood into position for the next row of holes to be punched across it, peg *A* being taken to the end of its row and gradually worked across again.

If 32 holes are required to the inch, the pegs are operated in the two inner rows in each case. Each of these two rows consists of 16 holes to the inch, the holes being staggered, so that if the peg alternates between one row and the other as it is shifted down, a result of 32 holes to the inch is obtained. An alternative of 16 holes to the inch can, of course, be obtained by keeping each peg to its one row of 16 holes. The principle only is shown in these illustrations, the punch, of course, remaining in the same position in relation to the baseplate all the time. The plywood and metal guide are held down by spring clips throughout the operation.

Another interesting model was a loan exhibit—the hull of a Thames sailing barge to ½-in. scale by Mr. E. L. Hayns. This model was left unpainted, so the workmanship was easily appreciated.

The beautiful blending of the hard chine with the curve at the bow can be seen from the photograph, the hull planks being in oak. The deck planks were in pitch pine, laid in authentic style, the joints being made as shown in section (Fig. 2). The joints between deck planks, in full-size practice, are plugged with oakum, and filled with pitch to make a really water-tight joint. Mr. Hayns had adopted the same method in his model, cotton thread being placed along the joints, which were then filled with pitch or "Bostik." In fact, the whole model followed the authentic method of construction, the frames being lined inside, and the deck planks finished off at the bows as in Fig. 1.

An interesting technical point is that the planks here should never come to a sharp point if the length of the portion of the plank which



Mr. E. L. Hayns' scale model hull of a Thames barge

tapers is longer than twice the width of the plank. Right up at the bow there is no problem, but as can be seen from the illustration, as the bow curve straightens out the tapered ends of the planks become longer. If they were brought to a point here, the taper would be so long, that there would be serious weakness and danger of lifting. The ends are, therefore, sawn off, the width at the tip being made half the full width of the plank.

The sheer of this particular sailing barge, incidentally, is not carried right through to the bow, but levels off towards the bow, thus providing a flat forecastle head for working on. The model followed the original in this respect, as in other details and the general standard of workmanship was high, all planks being fixed with brass screws, which were countersunk and the holes filled with stopping to represent the plugs in the prototype.

Of the models in the General Craftsmanship class, two farm wagons were noteworthy for their general attractiveness. One was a Gloucester farm wagon to 2-in. scale, by C. E. Rogers, and the other an Oxfordshire type wagon to $\frac{1}{8}$-in. scale, by E. J. Perkins.

The wheels in both cases were built up of six wooden sections to make up the full circumference, the sections being held together in orthodox fashion by metal tyres. Spokes were nicely chamfered, and cross-pieces at the base of the shafts were through-tenoned and wedged on the outside.

These well-finished models had an authentic rural atmosphere about them, metal fittings in the form of chains, etc., adding a most attractive touch. Both were awarded Diplomas.

Another attractive exhibit was a case containing miniature sports equipment to 3-in. scale, for which W. Lucking was awarded a Diploma. Here again, attention had been paid to quite minute detail, the stringing of the tennis racquet being most realistic, and, as the photograph shows, the cricket bat was actually spliced. Numbers on the dartboard were worked in wire and the miniature darts were made with brass bodies fitted with wooden shafts, slotted to take the flights.

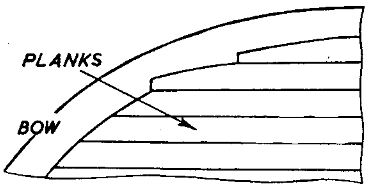


Fig. 1.

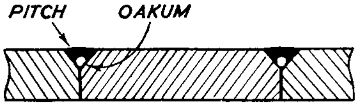
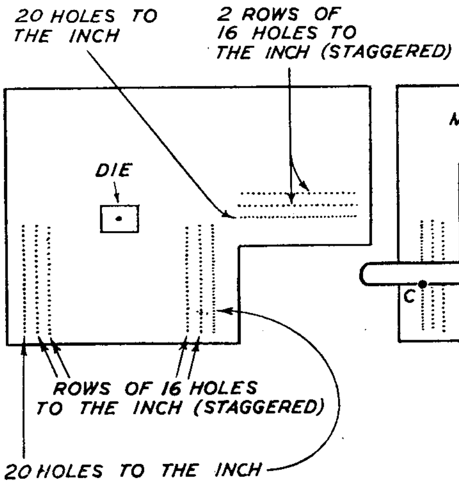


Fig. 2.



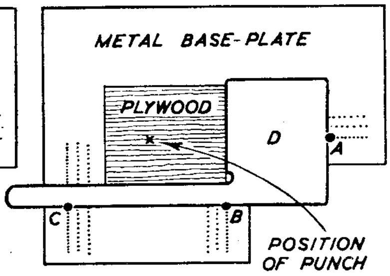
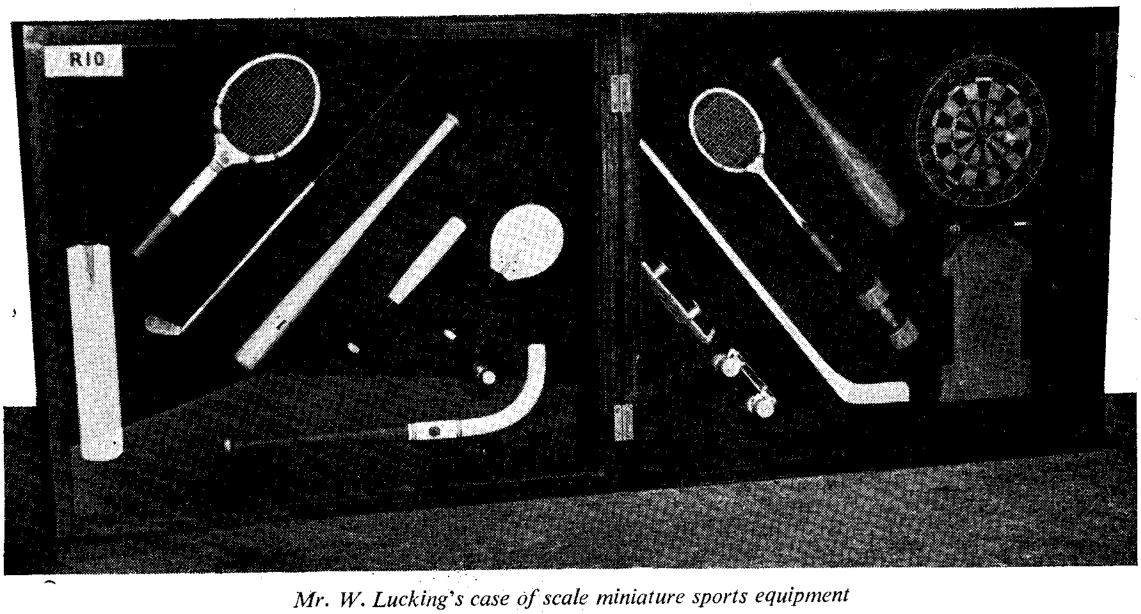


Fig. 4.

Left: *Fig.* 3.



Mr. W. Lucking's case of scale miniature sports equipment

IN THE WORKSHOP

BY DUPLEX

A JIG-SAW MACHINE

TO continue with the construction of the driving components, the next part to be made is the mild-steel connecting-rod *J*, fitted with a ball-bearing at the big-end. This bearing is of the standard light type, 7/32 in. in width, and having a bore of $\frac{3}{8}$ in.

The bushing *Ja*, Fig. 13, is made a close fit in the bore and, when the crankpin is fully tightened, the inner race of the bearing is securely clamped. The eye of the rod is bored to make the outer race a light push-fit and, with the bearing in place, the outer face should stand just proud so that it is held and turning is prevented by the pressure of the clamp ring *Jb*.

It is worth while taking some pains when fitting a ball-bearing for a duty of this kind, for disregard of the manufacturers' instructions to secure both the inner and the outer races may allow creep to take place, and bearing slackness will then develop.

On the other hand, making the races an interference-fit may more than take up the small amount of diametral clearance provided in a standard bearing, and this will lead to the ultimate destruction of the components. The two side-plates *Jc* must be securely attached to the end of the rod, as they take the driving strain; if preferred, a brazed joint can be made.

As will be seen, the lower end of the rod itself is cut off obliquely in order to increase the bolting area.

The shouldered bolt *Jd* forms the little-end pin and is hardened to resist wear. For lubricating the bearing, an oil-way is drilled obliquely in the front bearing-plate.

The Rocking Beam K, Fig. 14

As shown in the drawing, the mild-steel beam is fitted with three hardened steel bushes to form the working bearings. Although this arrangement has proved quite satisfactory over a fairly long period of working, there is no reason why the beam as a whole should not be case-hardened, and it would then be possible to fit hardened bearing pins of larger diameter. It will be noted that the distance between the two outer bearing centres is $\frac{1}{8}$ in. less than the inter-centre distance of the two baseplate brackets. The effect of this is to reduce the angularity of the connecting-rod on the working stroke in order to relieve the thrust on the corresponding crosshead slide-bar.

The Beam Rocking Bracket L, Fig. 16

This small bracket is pivoted on the motion-plate, and by its oscillating movement, enables the crosshead to travel in a straight line. The part should be case-hardened, and the hardened pivot bolt is tightened against the end of its thread and then secured with a lock-nut at the back

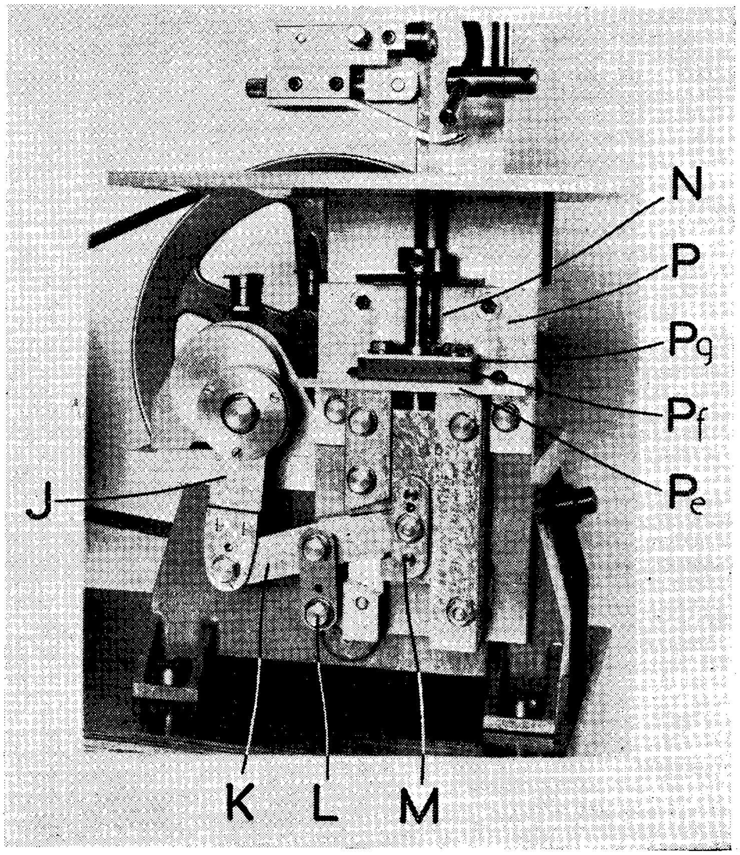


Fig. 15. J—the connecting-rod; K—the beam; L—the beam bracket; M—the crosshead; N—the drive-rod; P—the motion-plate; Pe—the driving-rod bearing bracket; Pf—the bearing block; Pg—the bearing cover plate

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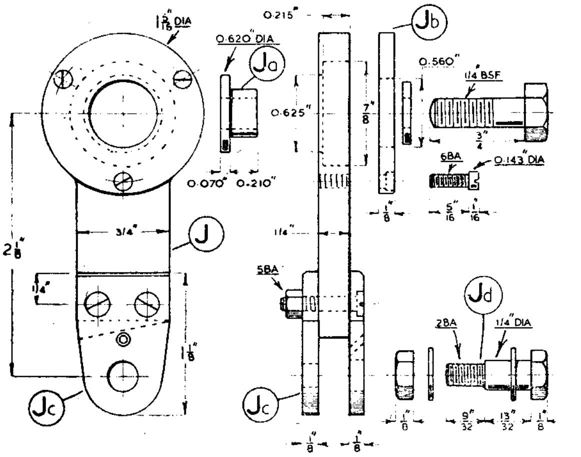


Fig. 13. *J—the connecting-rod; Ja—the big-end bearing bush; Jb—the bearing clamp plate; Jc—the little-end fork plates; Jd—the little-end pin.*

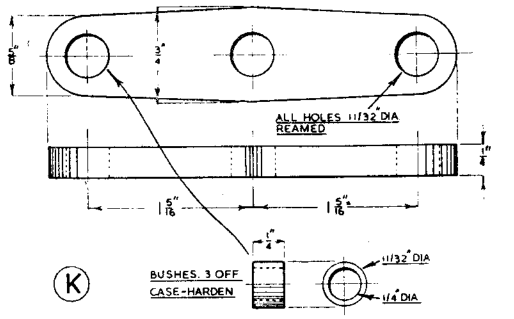


Fig. 14. *The rocking beam*

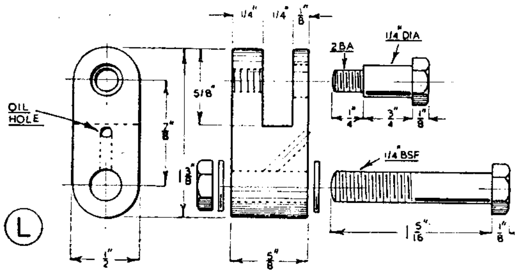


Fig. 16. *The beam bracket*

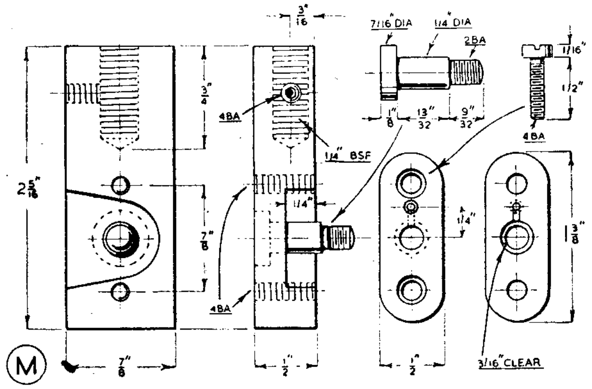


Fig. 17. *The crosshead with its bearing bolt and keep-plate*

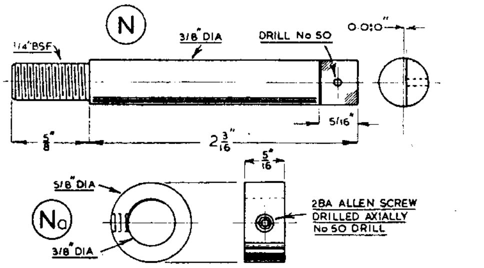


Fig. 18. *The drive-rod—N, and the saw fixing—Na*

of the motion-plate. To accommodate this nut, a hole is drilled in the foot member attached to the baseplate.

If preferred, a shouldered bolt can be used in this situation, but the parallel bolt fitted for trial has shown no sign of loosening. One would have liked to have given support to the outer end of this bolt, but the size of the material available for making the motion-plate did not permit of this arrangement.

The pivot screw for the beam is shouldered so as not to compress the fork on assembly. An oil-way is drilled obliquely in the front face of the bracket.

The Crosshead M, Fig. 17

As this part works against the steel motion-plate and slide-bars, it is best made of cast-iron to keep down friction and reduce wear. After the material has been filed or machined to the dimensions given in the drawing, a recess to take the end of the beam throughout its movement is formed by end-milling. The hardened pin is made a force-fit in the crosshead, and its free end is supported by a keep-plate, held in place by two 4-B.A. screws and a clamp-nut.

Careful fitting is required here; the inner surface of the keep-plate is counter-drilled so that the pin is firmly held when the keep-plate is bedded against the face of the crosshead.

It is most important to drill and tap the upper end of the crosshead exactly parallel with its long axis, otherwise the drive-rod N will bind as it moves in its bearing.

The crosshead is next tapped 4 B.A. on one side face for the grub-screw securing the drive-rod in place. Lubrication of the pin is by means of an oil-way drilled in the keep-plate.

Finally, the working faces of the crosshead should be hand-scraped flat and square with one another.

The Drive-rod N, Fig. 18

To resist wear, this part is made from a length of ground silver-steel. The lower end should be accurately threaded with a die or screwcut in the lathe for attachment to the crosshead. The upper end of the rod is filed down and then cross-drilled to form a seating for the lower end of the saw blade. The blade is held by the collar *Na*, which is fitted with a hollow grub-screw to engage the blade pin and clamp the blade firmly in place.

The Motion-plate P, Figs. 19 and 20

Mild-steel plate, ⅜ in. in thickness, is used for making this part. Both the back and front surfaces must be finished flat, and the upper edge

is squared to form a datum surface for marking-out the constructional hole centres shown in the drawings. Reference to Fig. 5 will make clear the purpose of the two upper holes; the threaded hole at the left-hand bottom corner is for the attachment of the beam bracket, and the three clearance holes towards the centre take the Allen cap-screws for securing the plate to the baseplate bracket *C*. After the three latter holes have been drilled, and the centre hole in the bracket *C* drilled and tapped, the parts are secured together in correct alignment with a single Allen screw and also with a clamp. Next, the two remaining holes in the bracket are spotted, drilled, and tapped with the parts still in position.

The Slide-bars Pa and Pb, Fig. 21

These are made from $\frac{1}{2}$ in. square mild-steel, scraped square and flat on the bolting and working surfaces. The left-hand bar *Pb*, after being drilled, is first clamped to the motion-plate, so that the working face lies parallel with the scribed centre-line on the plate and $\frac{7}{16}$ in. from it. The holes for the attachment screws are then spotted, drilled, and tapped. It will be noticed that, as a matter of convenience, the lower screw has been inserted from behind, but this screw can be put in from the front if its position is lowered to clear the recess formed in the slide to accommodate the beam. When the left-hand bar has been fixed, the right-hand slide-bar *Pa* is clamped in

(*Continued on page* 398)

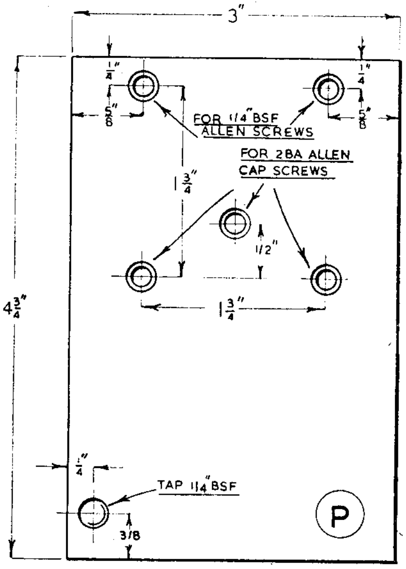


Fig. 19. Showing the location of the screw holes in the motion-plate

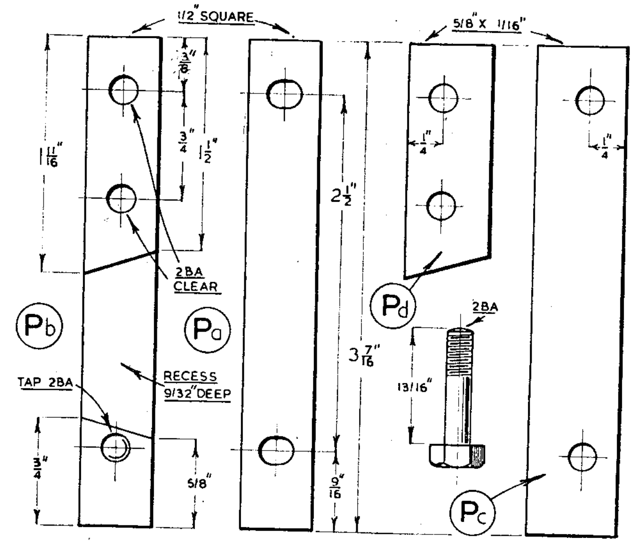


Fig. 21. Pa and Pb the right- and left-hand slide-bars; Pc and Pd the corresponding keep-plates

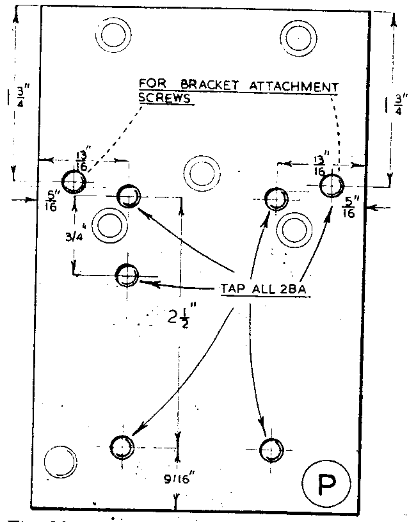


Fig. 20. The motion-plate with the screw holes for the slide-bars and bearing bracket added

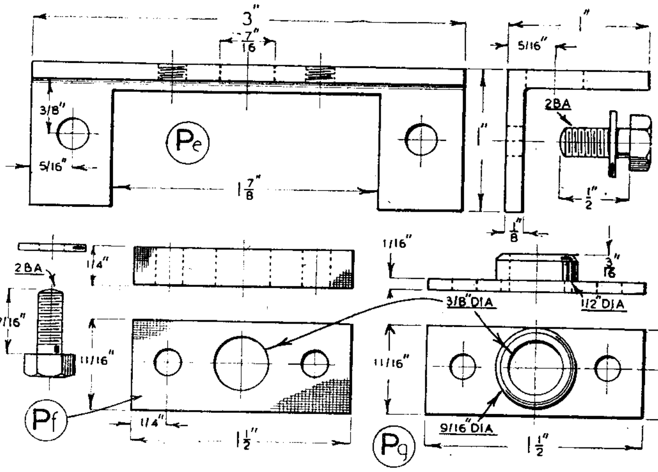


Fig. 22. Pe—the driving-rod bearing bracket; Pf—the bearing block; Pg—the cover plate

ORNAMENTAL TURNING
on a Screwcutting Lathe

By F. R. N. Curle

A cigarette box turned in Blackwood and Ivory

ORNAMENTAL turning was at its zenith in the second half of last century. The fifth volume of Holtzapffel's monumental work—the one dealing with this branch of turning—was produced in 1884. At that time, a man who combined a taste for mechanics with leisure and money had little outlet compared with his descendants of the present day, who usually, however, have neither the leisure nor the money ! The procedure might be to order from Messrs. Holtzapffel & Co., or one of the other makers, a lathe and outfit of appliances, the bill for which might easily amount to four figures, and probably included many items which were seldom if ever used or even understood.

I expect that the first thing that adversely affected ornamental turning was the arrival on the market of small screwcutting lathes which opened up a completely new field. The next blow came from the bicycle and later, the motor car, both mechanical outlets. People of means then usually kept a chauffeur, often a trained mechanic, and as the early cars needed and got much more tinkering than modern ones require, the chauffeur would get a suitable lathe, and the masterpieces of Holtzapffel & Co. and others would be relegated to the background. These old lathes were, however, of the finest material and workmanship, and probably considered to be too good for scrap. But now people are moving out of larger houses into flats and mews, and no doubt will be only too glad to find a kind home for their fathers' or grandfathers' cherished possessions at a very reasonable price. Possibly an advertisement in a good class country weekly paper as well as THE MODEL ENGINEER might produce some result.

Anyone who keeps a lathe for pleasure rather than profit must sometimes wonder what to make next, and I would suggest that a little spell of ornamental turning might fill this blank; not only is it very good fun and free from the strain of work demanding great accuracy, but the results of one's labours are usually quite welcome gifts, and friends appreciate a cigarette-box or ash tray or "what have you" that is obviously not mass-produced.

Many years ago I was given a screwcutting lathe, treadle driven, as they all were then. It is far from being a precision tool, though I have improved it as much as I can, but it has certain advantages—5 in. centres, very easy running, and the mandrel pulley when disengaged runs very easily, too. This is a great advantage for overhead work, as it enables sufficient speed to be got up without much effort by driving on to the small groove, and from the large one to the cutter spindle. There is a division plate with two rows of holes and a good strong spring index.

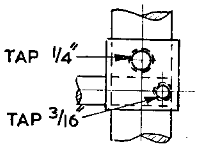
I soon found that the most interesting and rewarding work I could do was to make appliances for my own lathe, and after fitting chucks (I still have the self-centring and independent chucks made by Cushman, which are as good and accurate after half a century as when I got them), I made an overhead gear, in fact, more than one, until I was satisfied, and drilling, milling and grinding spindles for use with the overhead. The lathe is driven by a $\frac{3}{8}$ in. round leather belt, the above spindles by a $\frac{1}{4}$ in. belt, and the ornamental cutters by $\frac{1}{8}$ in. These belts last for years.

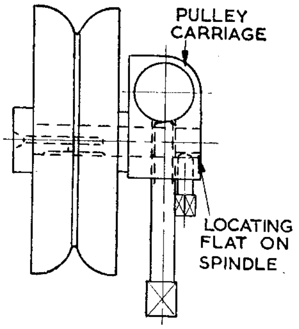
About this time I had a great stroke of luck. An old friend of mine had bought at a sale an ornamental lathe by Holtzapffel & Co. with many cutters and appliances. This had originally cost, I was told, about £1,100. My old friend treated it with more veneration than comprehension, and as a boy I was not encouraged to use it. However, later, he had a bad fire at his premises, and when the insurance company had settled his claim he kindly told me that I might salvage anything I wanted. Accordingly, I took the slide rest and various revolving spindles and cutters; many parts had been lost, and some of the brass work melted. It took me, as far as I remember, my spare time for about two years to get everything into going order, but with the help of my lathe and one of Drummond Bros. excellent shapers, I eventually managed to do so. It was a most interesting and enjoyable job of work.

My next stroke of luck was a visit from a friend who was an engineer in a ship on the upper Nile. He asked me what wood I preferred; I told him African Blackwood, and on his next leave he brought me a wonderful present of several big logs. These were in the rough, what might be truly called "rugged," a word that now seems to mean sturdy and strong—thanks to American films ! It was quite a big job turning these down to circular shape, and I was very thankful for my 5 in. centres. This wood is very hard, and ruins an ordinary wood saw, and I found a hack-saw with coarse teeth the most suitable. Blackwood is splendid for ornamental work—very dense, it takes a brilliant polish from the tool if really sharp, and seems to be free from silica, from which some other

woods such as ebony suffer. Ivory was the material usually used for this kind of work but was far too expensive for me.

It seemed clear that fate meant me to go in for ornamental turning





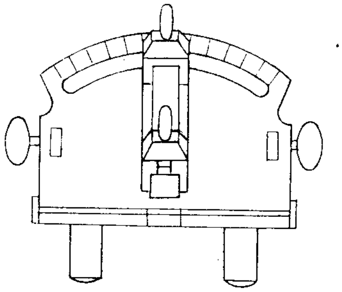
and I have never regetted it, though I have by no means given up my original love for working in metal. Fortunately, the two go quite happily together, and I do not have to make any choice.

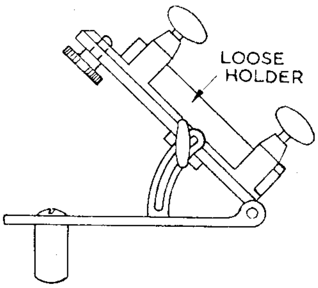
And now for some hints to help anyone who would like to give this form of turning a trial. If you can get a complete outfit and have room for it, then take it; but if you wish just to add to the powers of your present lathe, a good deal depends on the lathe. Ornamental lathes had, I think, as a rule, $5\frac{1}{2}$ in. centres, and in my case it meant cutting down the height of the rest half an inch, which I managed to do. With lathes of lower centres, a few tools, such as eccentric, vertical and universal cutters, and a drill spindle might be used. A special fitting would be required to hold them, but of course a complete slide rest is far more useful. Mine has depth stop, fluting stops, curvilinear fitting and screw elevation for the whole rest. It also has adjusting screws so that it can be swivelled lengthways or across the bed without trouble. It has a cradle which keeps it in place. The cradle had to have brass strips added to fit between the shears of the lathe bed, and a special handle for the wedge and screw which holds it to the bed. I have also acquired an eccentric chuck and made a worm drive for the lathe mandrel.

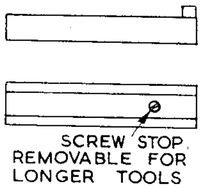
The overhead which I evolved is not, I know, original in principle—the main part is a $\frac{5}{8}$ in. rod of mild-steel about 30 in. long; it could no doubt be $\frac{1}{2}$ in., but I had the other. To this rod are fixed four holders for pulleys, and the holders are locked by screws. The pulleys can in this way be fixed at any angle so that the belt gets a true run. The pulleys, which are of boxwood, about $2\frac{3}{4}$ in. in diameter, run on silver-steel $\frac{5}{16}$ in. shafts with bearings $\frac{7}{8}$ in. long. The shafts have ends shrunk on and turned, but I did not touch the silver-steel except to drill an oil hole down the centre and to mill a flat at the bottom side to allow the oil to get at the bearing; the other ends of the pins are also milled on the same line; a $\frac{5}{16}$ in. bright washer is put between the pulley and the holder. To keep the pin in place, there is a small pinching-screw, also with a square head; the pulley should run free, but without end play. The carriages for the pins are made of $\frac{3}{4}$ in. square steel, $1\frac{1}{4}$ in. long. They are bored through with $\frac{5}{8}$ in. holes, the centre being $\frac{3}{8}$ in. from one end. One end of the top is rounded off to avoid interference. Pinching-screws about 2 in. long, of $\frac{5}{16}$ in. steel, turned down and screwed $\frac{1}{4}$ in. at one end, and the other end squared off for a lathe key, fix the pulley where required on the bar. The pulleys are made from old croquet mallet heads of boxwood without any metal bushes, and they have run for over 30 years without any sign of wear—believe it or not—probably because the wood revolves. They need only very occasional oiling. The bar is hung from the ceiling, and in my case has a considerable adjustment, as it is fixed in a U with long arms, and the strip working inside the U has a number of holes so that it can be located by a cross pin. Lead balance weights, about 5 lb., at the left end of the rod supply the necessary tension. It certainly combines simplicity and efficiency.

And now, an important point—nothing is more irritating than for belts to jump off pulleys. Considering this one night, I thought it might be due to the belt catching on the sharp edge of the pulley, and I experimented and found that this was just what happened. I accordingly removed all Messrs. Holtzapffel's pulleys and fitted new ones with a definitely rounded V. This has made a wonderful difference; the belt now clings to the pulley even when coming from a considerable angle.

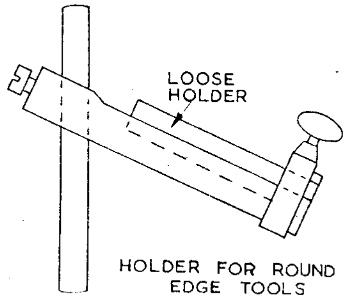
Ornamental turning is pointless unless the result is really ornamental; merely cutting a series of circles or grooves is no use. Tools must be sharp and driven at a high speed. There is no excuse for poor work in this respect. Work properly cut should sparkle and reflect light. No subsequent treatment is possible; all that is necessary is a rub with furniture wax and polish with a stiff brush. If, after a time, the



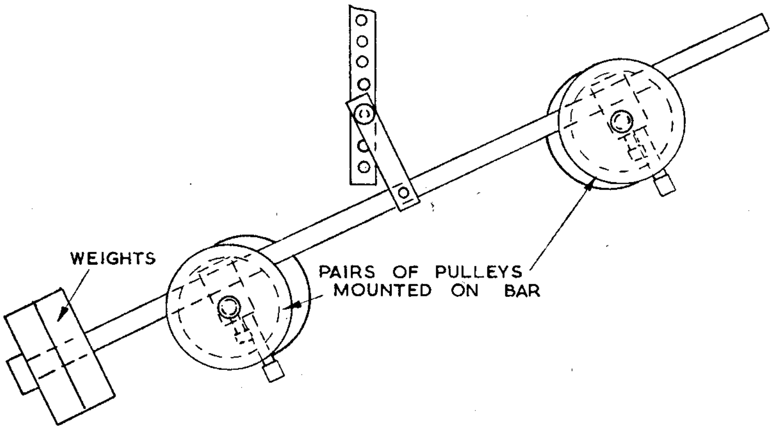




CUTTER HOLDER FOR USE IN GONIOSTAT PROBABLY TWO SIZES REQUIRED



HOLDER FOR ROUND EDGE TOOLS



polish gets dull, it can be renewed without difficulty.

Design is something I do not propose to be dogmatic about. I seldom satisfy myself, but I suggest that elaborate "built up" work such as illustrated in some of the old books is not now popular. I also suggest that it is pointless to attempt to imitate in wood the shape of things made of clay or plastic.

In dealing with valuable wood it seems only reasonable to use the full size—a cigarette box, for instance is probably more valued than a stud-box. My turning has nearly all been done in Blackwood. Boxwood is excellent, but does not have as good an appearance, I think, though it is invaluable for many purposes. Never miss a chance to pick up an old croquet set. Beech is also excellent, and can be obtained in a good size, but it will not take the same clean cutting and polish, though it is very useful for chucks. One or two cup chucks are needed, and can be fitted with wood blocks which can be turned out as required. I do not know if any modern plastics are adapted to this form of turning; if they are, some of the drudgery might be avoided.

Cutters must be kept sharp; the appliance used for this purpose is known as a Goniostat. Two are needed; one for flat edges, with two feet, and another for round ones, with one foot. The arrangement I use for sharpening is a flat box about 8 in. long. Half of it is covered with a strip of glass for the foot or feet of the Goniostat to lean on; the other half has three blocks let in—the first a bit of fine carborundum stone (seldom necessary), the next a brass plate used with oilstone powder, and the last, cast-iron, used with crocus; all require oil. These are at slightly different levels, the iron being lowest so that the final polish is given at the extreme edge. I have two sizes of cutters, and accordingly I have holders for both which will go into either of the appliances; in each of these holders a screw is let in so that the cutter bearing against the head of the screw always returns to the same place. To sharpen longer tools, these screws can be removed. With the help of these appliances no particular skill is needed to keep edges in good order.

There is certainly a problem with modern power-driven lathes; foot drive is much more convenient and little power is required. Possibly a clutch might help—I do not know—but the late Mr. George Adams used to advertise several types of foot-motors and no doubt they are still obtainable. The driving wheel should be large to give a good speed. Mr. Adams, whose catalogues were a mine of information, for many years supplied my trivial requirements for tools and material, and these always arrived in Scotland by return of post.

Of course, I have not got a complete ornamental outfit. Many things I cannot do, such as oval and spiral work, but I would much rather have the power to work in metal than be able to turn oval. I remember the late Mr. Evans telling me that a customer of his turned an oval box with an oval lid, screw cut the fitting, and was upset to find it would not work. Oval work would, I expect, be used because tusks were usually oval and thus waste was avoided.

I am afraid few can expect to get the strokes of luck that I have had, but I am sure that anyone who can take up this branch of turning will get some of the pleasure that it has given to me for so long.

A JIG-SAW MACHINE

(*Continued from page* 395)

place, with the crosshead in position and able to move freely from top to bottom.

The holes in the motion-plate are then drilled and tapped as before. As shown in the drawing, the screw holes have been opened out to allow for adjustment; but if the parts are correctly fitted in the first instance, this may not be needed until later for the purpose of taking up wear. Although only two fixing-screws are shown, a third central screw may well be added.

The two keep-plates, *Pc* and *Pd*, are held in place by the fixing-screws and, if necessary, shims can be used to obtain the required working clearance. The motion-plate, showing the position of all holes so far drilled, is illustrated in Fig. 20; in addition, the position of the screw holes for attaching the next component, the driving-rod guide bearing, is also indicated.

The Driving-rod Guide Bearing Pe, Pf and Pg, Fig. 22.

The bracket *Pe* is made from 1 in. $\times \frac{1}{8}$ in. steel angle and serves to carry the bearing block *Pf* and the cover-plate *Pg*.

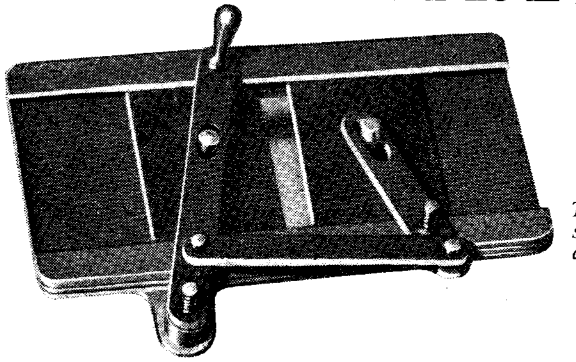
The bearing-block is made of Tufnol, as this material requires no lubrication and seems almost impervious to wear. The central hole is bored or reamed to a close sliding fit on the drive-rod, and the holes for the two attachment-screws are also drilled.

The cover-plate is fitted with a collar to help in deflecting swarf away from the bearing. The parts, including the bracket, can now be assembled on the motion-plate, with the drive-rod and crosshead located between the slide-bars. The bearing parts are next clamped to the bracket, and their position is adjusted to allow the drive-rod to slide freely.

The bracket is then clamped to the motion-plate and its two attachment-screws are put in. After the backet has been detached, the bearing parts, while still clamped in place, will serve as a guide for drilling and tapping the holes in the bracket for the two fixing-screws.

(*To be continued*)

FIREHOLE DOORS

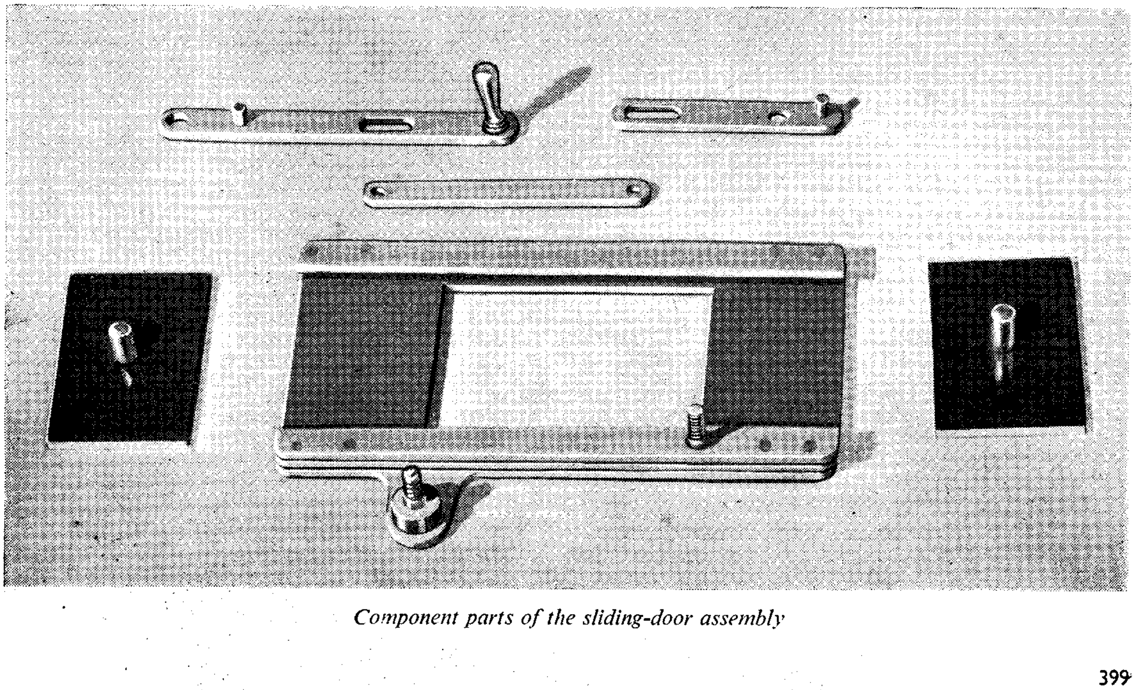


By H. E. White, B.Sc.

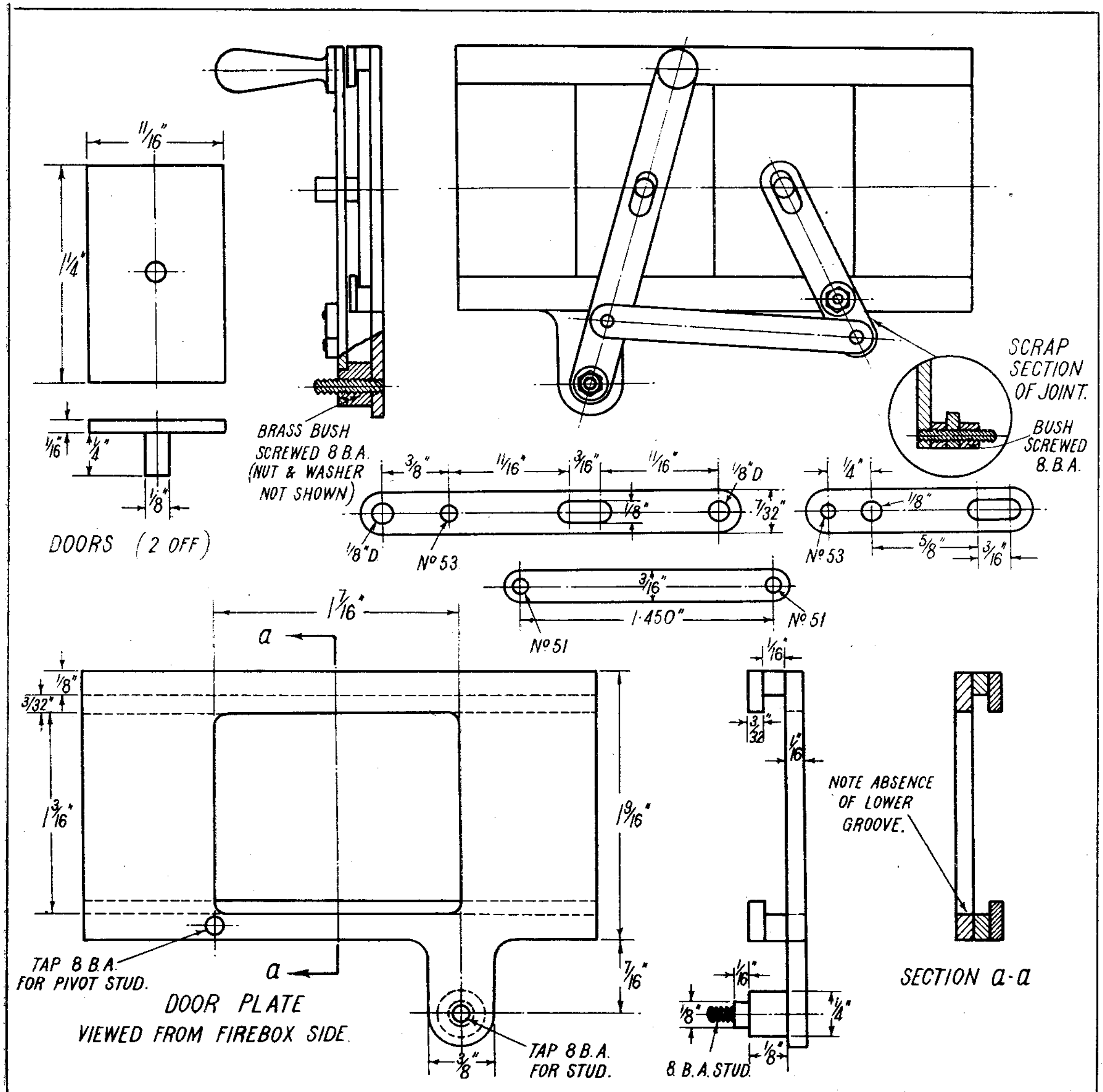
The sliding-door assembly ready for attachment to the backhead

MOST small-locomotive men know that the ordinary simple swing door is effective and satisfactory. But there are some awkward, obstinate fellows who don't use them—who like to do things differently. I'm one of 'em. Many years ago, my first two locomotives (3½-in. gauge Pacific and Atlantic engines) had swing doors which served their purpose and gave no trouble ; but the next four engines I made had to have something different, because there seemed to be no sense in repeating the same thing over and over again. First of all, I tried a new idea in sliding doors on *Facilitas*, a 3½-in. gauge 4-6-2. I had heard all the objections, and decided to try to overcome them. The only important one seemed to be that the lower groove in which the doors run could become choked with coal dust, which would prevent the doors closing properly. The solution was obvious—*do away with the lower groove*. A set of doors was made up incorporating this feature, and after the engine had been running for a couple of years I considered the design was satisfactory. By " running " I mean several hours in steam on all kinds of tracks nearly every week-end during the season, and with several drivers, so that the doors were given a thorough test under all kinds of running conditions. The design was then adapted for two or three engines—my own and other people's—and all of them have been busily running ever since, the doors giving no trouble whatever. At track meetings and exhibitions, I am always being asked what happens when the sliding doors on the *Flying Dutchman* get choked with coal dust. I invariably reply by opening the doors, tipping a shovelful of coal dust and bits of coal right on to the lower runway and then closing the doors in the ordinary way. One minute's demonstration is worth an hour of talk !

As a matter of fact, I consider sliding doors, when they are efficiently designed and made, to be the easiest to operate under varying track conditions. Furthermore, with a swing door, it is difficult to exercise any degree of regulated control over the firedoor opening when the engine is running on some of our rough-riding continuous tracks, whereas the sliding door permits of easy adjustment of " top air "—just a tap with the shovel on the lever. The width of the slit through which the glowing fire can be seen responding to the pull of the beats of the engine gives a clear



Component parts of the sliding-door assembly

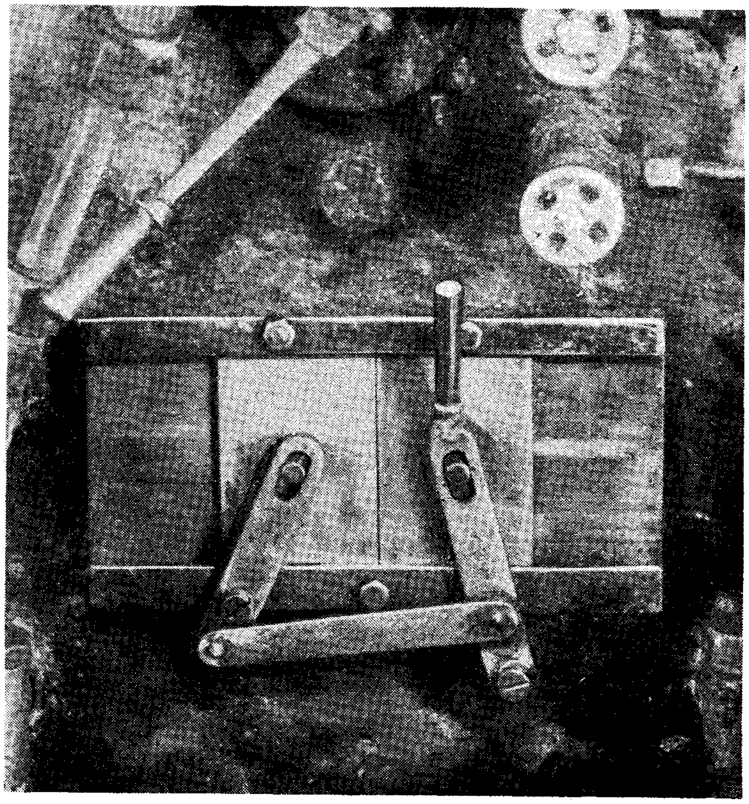


Design for a sliding-door, dimensioned for a $3\frac{1}{2}$-in. gauge locomotive

indication of the degree of opening. What is more, when the opening has been adjusted, the door stays put !

The simple secret of the design is that the *lower* running groove is single-sided ; *the half nearest the fire is missing* ! The door assembly is built up on a plate which has a hole cut out in the centre the same size as the firehole. The two runners are then made up—they may be built up with two pieces of brass strip of suitable thicknesses as shown in the drawing, or milled out to the required section from 5/32-in. brass strip. These are not really " runners " but, having an " L " section, they are only half-runners, not being complete until they are fixed to the door-plate, which forms the front half of the groove. They are attached to the door-plate with $\frac{1}{16}$-in. brass rivets (I used bits of $\frac{1}{16}$-in. Sifbronze rod) beaten over into countersinks on both sides and filed off flush. The top runner is fitted so that its lower edge is level with the top of the firehole opening, but the bottom runner is fitted so that its upper *inner* edge is level with the edge of the firehole. This means that, in effect, the top runner is double-sided throughout its length, whilst the lower runway is single-sided for the whole width of the door-hole and *a one-sided groove cannot choke.*

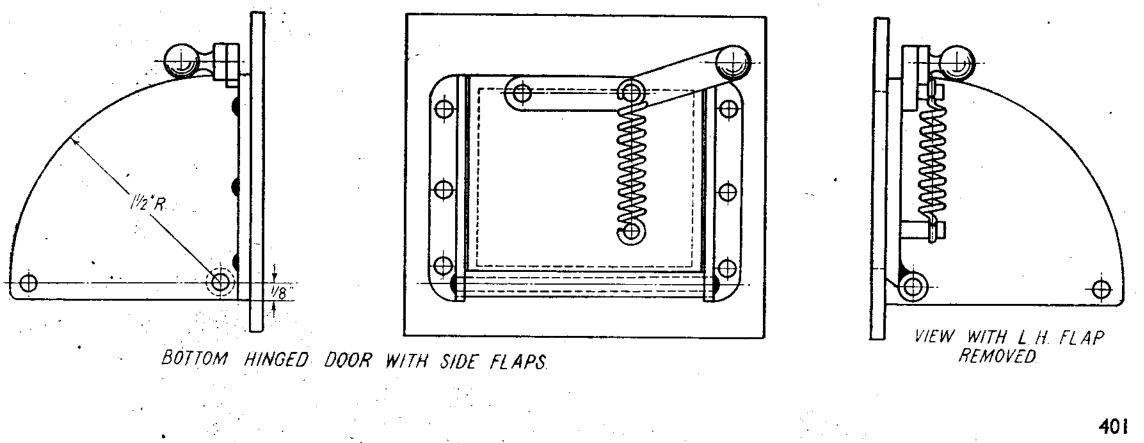
The doors themselves are pieces of 16-s.w.g. brass plate with shouldered pegs fitted, at the intersection of their diagonals, by riveting. They should slide very freely. They are operated by two levers, the long lever moving the short lever by means of a connecting link in the usual way. The two levers are made



Sliding doors fitted to one of the writer's $3\frac{1}{2}$-in gauge engines

up from strips of $\frac{1}{16}$-in. steel. Short lengths of $\frac{1}{16}$-in. silver-steel rod are driven into the No. 53 holes to form pivots for the link. Slight errors of a few thousandths in the marking-out and drilling of these levers will have no perceptible effect on the working of the doors, but the distance between the holes in the connecting link is very important. Quite a small variation in the position of these holes may cause uneven opening and closing of the doors. The measurements given are taken from the actual job, but if there is any doubt about the accuracy of the marking-out and drilling, proceed in the following manner: Set the doors in the correct closed position, with the joint-line in the centre of the firehole. Place the two levers in position and, with a pair of dividers, find the distance between the two $\frac{1}{16}$-in. pivot pins. The link can now be marked-out with this setting of the dividers, and your doors cannot help closing correctly. The knob shown at the top of the operating lever is better than the usual bent lever shown in one of the photographs, the shovel gets hold of it much more easily. The whole assembly should be adjusted to work freely—repeat, *freely*—before it is fitted to the backhead. Two or three screws will be sufficient for this, after bedding the door-plate on to the backhead with some kind of joint compound. I used red-lead and oil on the first engine, and cellulose paint filler on the others. You will note that the doors shown in one of the photographs have the long lever on the right, because I like it that way. In the drawing and in the other photographs the long lever is shown fitted on the usual side.

When I made the 4-8-2 *Flying Dutchman*, since the sliding doors on the previous engine had given two years' trouble-free service, I liked them so much that the new engine was similarly equipped. Then I began to look around for something else to try out, and when my next engine (the Beyer-Garratt) got her boiler, it had a firehole door hinged at the bottom. I had seen this type of door in use on several other small engines and it happened to suit the Garratt's requirements. This type of door, with its side wings or guide-plates, is easily managed, and is excellent for use on continuous tracks. The side-plates serve to guide the shovel, and this is an undoubted advantage with engines having long tenders and consequently long shovel handles. The design proved so satisfactory for this engine, in which the backhead is such a long way from the driver, that I have fitted a revised edition complete with all the latest improvements, to my new 2-6-6-4

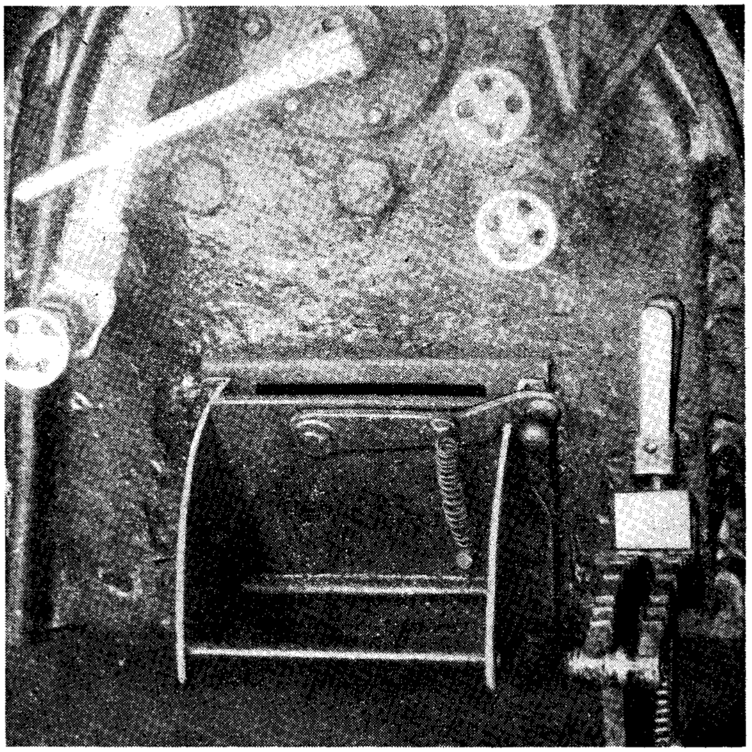


BOTTOM HINGED DOOR WITH SIDE FLAPS

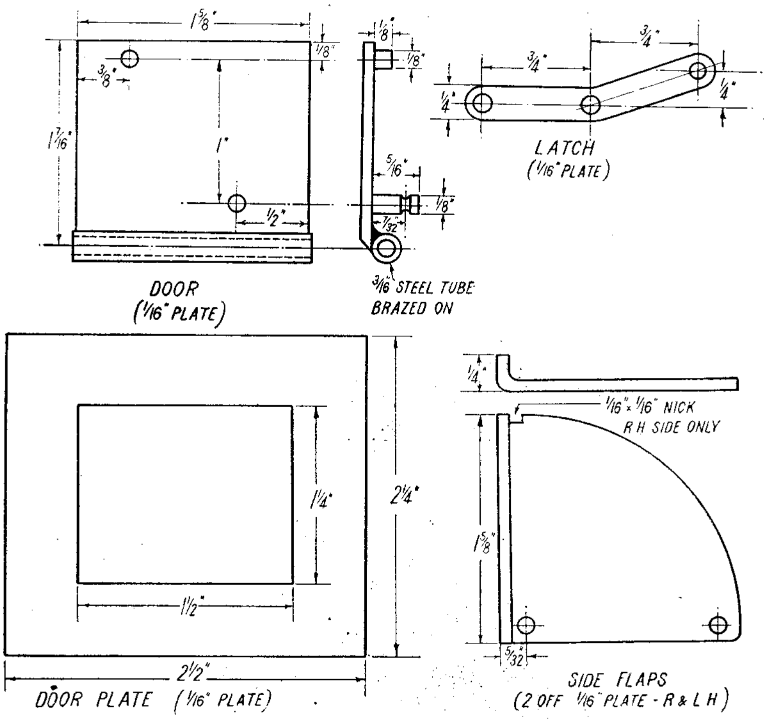
articulated engine, which has a tender more than 2 ft. long.

Again, a door-plate is used, cut from $\frac{1}{16}$-in. steel plate. Mr. Austen-Walton would probably use stainless-steel for this, if he could be persuaded to make up such a door, and indeed the complete assembly would look very nice in this material. Cut out the hole to fit the firehole : I always use rectangular fireholes in my boilers, but the rectangular hole in the door-plate will fit over an elliptical firehole if necessary. The side-plates of the door housings have bent over flanges which are attached to the door-plate with rivets. The door is cut to allow a fair clearance between it and the side-plates, so that coal dust will not cause clogging, and for this reason it would be better, perhaps, to take an accurate measurement between the side-plates to make sure of this.

The hinge at the bottom of the door is formed by brazing a length of $\frac{3}{16}$-in. steel tube at its lower edge. I made up this tube by putting a $\frac{1}{8}$-in. drill through a piece of $\frac{3}{16}$-in. steel rod. The apparently large size of this hinge is advisable because it allows the door to move away from the lower edge of the firehole when it is opened, thus forming a gap through which coal dust can escape. To make this doubly certain, it will be noticed that the lower edge of the door is bevelled. A hinge pin of $\frac{1}{8}$-in. steel is passed through holes in the side-plates, and lightly riveted over at the ends.



The bottom-hinged door fitted to the $3\frac{1}{2}$-in. gauge Beyer-Garratt type engine

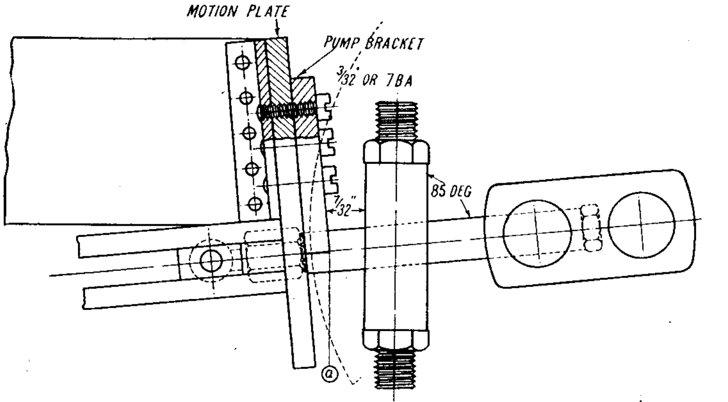


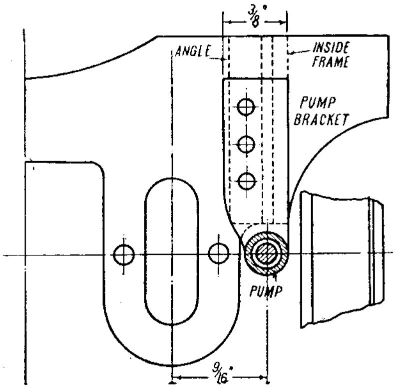
The latch is filed up from $\frac{1}{16}$-in. steel plate and it swivels on a $\frac{1}{8}$-in. peg which is fastened to the door by shouldering and riveting. The latch also carries a similar peg in the middle, which has a groove around it in the position shown. A similar grooved peg is located lower down on the door, and the ends of a tension spring are slipped over these pegs. This latch will hold the door in any position by friction on the edge of the right-hand side-plate. At the top of this plate there is a single " nick " which holds the door securely in the closed position. The knob shown on the end of the latch is intended to be operated with the shovel. A baffle-plate of the usual type can be fitted to this type of door, but I have not bothered to fit one, as I do not think such an addition at all necessary on such small engines, and it is not worth the slight obstruction it would cause. As in the case of the sliding doors, the position of the handle can be reversed if you want it on the left-hand side.

L.B.S.C.'s *Titfield Thunderbolt*

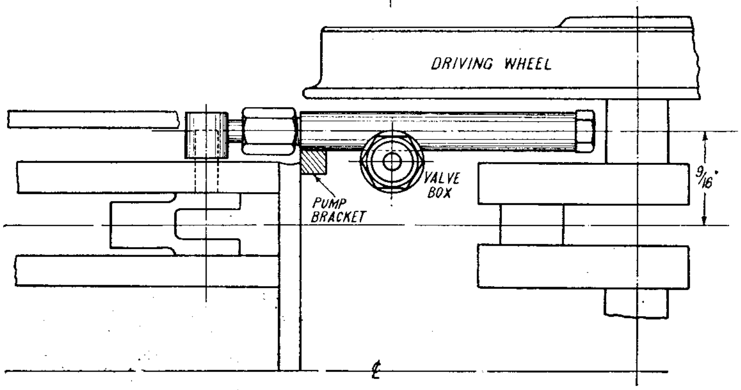
IN 3½ AND 5 INCH GAUGES

THE full-sized *Titfield Thunderbolt* had two crosshead pumps, but we shall need only one, as we are fitting an injector as well. It is a good job only one will be required, at that, as we are up against the "scale" difficulty once more. On not-so-big sister, the space available was sufficient for the accommodation of the pumps, but if we fitted "scale" replicas, they would be useless for serious work; so I have had to scheme out pumps of a suitable size for the job, and there isn't much room in which to put them. However, the job is done, and the accompanying illustrations show how. Incidentally, when locating the pump on the motion-plate of the 5-in. gauge engine, I found that I had inadvertently made a mistake in dimensioning the distance between the centre-line of the engine and the centre of the slot in the motion-plate for the connecting-rod; and I added a note about this, when checking the proofs of the last instalment, to call attention of 5-in. gauge builders to the error, to avoid giving them useless work. As a drawing of half the motion-plate is needed to show how the pump is erected, I have included the correct dimension on this, viz. $1\frac{1}{4}$ in. instead of $1\frac{3}{8}$ in. and I humbly beg your kind indulgence for the slip. I find it "hard going" at times !



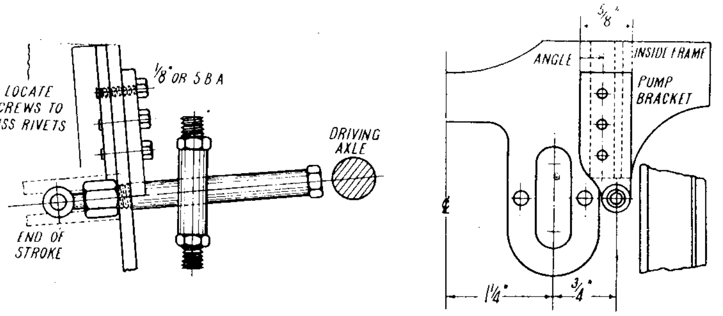


Section at (*a*)



Three views of the crosshead pump for the $3\frac{1}{2}$-in. gauge engine

The type of pump shown is the same as fitted to my L.B. & S.C.R. *Grosvenor*, and this has given complete satisfaction right from the day that the engine first took the road, up to time of writing. Although the ram is only $\frac{1}{8}$ in. diameter, the pump is complete "boss" of the $3\frac{1}{2}$ in. diameter boiler, and the water will creep up the glass when running with a normal load, with the bypass valve closed. It is therefore, logical to assume that the same size of ram, with only $\frac{1}{4}$ in. shorter stroke, will feed the $3\frac{1}{2}$-in. gauge "Tit" boiler when steaming at full capacity. The only difference between the pump on my engine, and that shown, is that the former has the valve-box nearer to the gland, and the end of the ram is screwed directly into the slide-block; and the one shown drives from the end of the crosshead-pin. The pump barrel is necessarily parallel to the centre-line of motion, which has a 5-deg. slope; and in order to keep the valve-box vertical, it must be attached to the pump barrel at a slight angle, as shown. The valve-box on both $3\frac{1}{2}$-in. and 5-in. gauge engines, is the same size; it will deal with the extra amount pumped by the larger ram, without any trouble. I found by experiment, that a similar-sized valve-box with 5/32-in. balls, will do the needful on a hand pump with a ram $\frac{1}{2}$ in. diameter. A smaller valve-box would, of course, have



Arrangement of crosshead pump for the 5-in. gauge engine

worked on the $3\frac{1}{2}$-in. gauge engine's pump; but I don't care to go below 5/32 in. for the ball valves.

Pump Barrel

Our approved advertisers who are enterprising, may supply a casting incorporating barrel, valve-box, and bracket; if they don't, it is easy enough to build up the pump. On the $3\frac{1}{2}$-in. gauge engine, the pump barrel can be made from $\frac{1}{4}$ in. round bronze or gunmetal rod. Saw or part off a piece $1\frac{7}{8}$ in. long. Chuck truly in three-jaw, face, centre, and drill right through with No. 34 drill. Screw $\frac{3}{16}$ in. of the end $\frac{1}{4}$ in. × 40. Reverse in chuck, face the other end, and put a $\frac{3}{16}$ in. drill down for a depth of $1\frac{7}{16}$ in. Tap the end 7/32 in. × 40, and make a plug to fit, from $\frac{1}{4}$-in. hexagon rod, as shown. Reverse in chuck once more, and poke a $\frac{1}{8}$-in. parallel reamer through the remnants of the No. 34 hole. Make a gland nut to fit the screwed end, from $\frac{5}{16}$-in. hexagon rod as shown; drill the hole for the ram, with No. 30 drill. At 1 3/32 in. from the plugged end, drill a $\frac{1}{8}$-in. hole into the enlarged bore of the barrel, and be careful to clear out all chips and burrs.

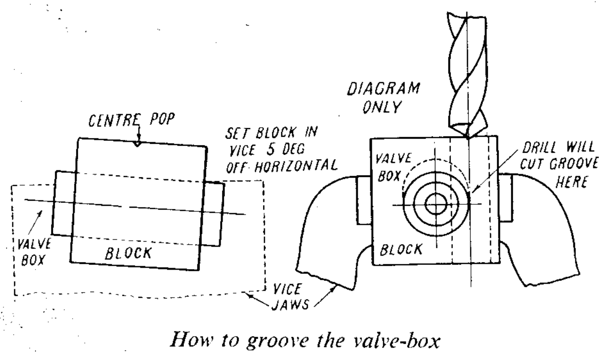
The pump barrel for the 5-in. gauge engine is machined up in exactly the same way, working to the sizes given in the drawings for the bigger edition.

Valve-box

The valve-box for both the $3\frac{1}{2}$-in. and 5-in. gauge pumps, is made from $\frac{3}{8}$-in. round rod; part or saw off a piece a little over 1 in. long. Chuck in three-jaw, face the end, centre, drill right through with No. 34 drill, open out and bottom to $\frac{5}{16}$ in. depth with 7/32-in. drill and D-bit, tap $\frac{1}{4}$ in. × 40 (don't let the tap hit the valve seat) and slightly countersink the end, skimming off any burring. Reverse in chuck, and repeat operations on the other end; but instead of D-bitting, cross-nick the bottom of the hole with a small chisel, as shown. Exactly in the middle of the barrel, drill a $\frac{1}{8}$-in. hole from the side, into the centre passage; then re-chuck, and put a $\frac{1}{8}$-in. parallel reamer through the remains of the No. 34 hole.

Now we come to a bit which appears to be very tricky, but really isn't anything of the sort; everything is easy *when you know how*. A half-round groove is required in the side of the valve-box, which not only needs to be a perfect fit for the pump barrel, but cuts across the valve-box at an angle. On account of the pump barrel being set at 5 deg. off the horizontal, the groove must be cut to suit. It would take a clever file-juggler to cut it absolutely O.K. with a round file; it would need a milling-machine with a round-toothed cutter, either regular type, or fly-cutter, to do it by "orthodox" methods; yet any beginner with an average amount of gumption, can do the job, and get a precision fit, on his drilling-machine or lathe. All you need, is a block of metal about $\frac{3}{4}$ in. square; brass, or anything else that may be handy. Drill a $\frac{3}{8}$-in. hole through it, which should be a tight fit for the valve-box, and push the latter in, so that the place where the groove is required, is halfway along the block. Immediately above this, at $\frac{3}{16}$ in. off centre for the $3\frac{1}{2}$-in. gauge engine, and $\frac{1}{4}$ in. off centre for the 5-in. gauge engine, make a heavy centre-pop. Set the block in the machine-vice on the drilling-machine table, with the valve-box canted over at the correct angle, as shown in the detail sketch; put a drill in the chuck, same size as the pump barrel, and drill clean through the block at the centre-pop. As the drill passes the valve-box, it will cut the required groove. Quite simple, isn't it? If a drilling-machine isn't available, the lathe can be used by putting a drilling-pad on the tailstock barrel, and holding the block against it in the machine-vice at the correct angle, operating with the drill in the three-jaw.

Remove the valve-box from the block, fit the pump barrel into the groove left by the drill, and tie it in position with a bit of thin iron binding-wire, ready for silver-soldering. The bracket can then be made; this can also be fitted to the pump barrel by aid of a drill. When marking out the bracket, leave enough at the bottom, to allow for a hole being drilled in it, the size of the pump barrel. Make a centre-pop at the correct location, drill the hole a tight fit for the barrel, and squeeze it in, making certain that the bracket is at the right spot. It should stand exactly at right-angles to the barrel. The whole lot can then be silver-soldered at one heat, using best-grade silver-solder, or Easyflo. Use the Cohen-McPherson technique when doing the job, as too much silver-solder will either partially block the passage between pump barrel and valve-box, or close the hole altogether. Did I hear somebody whisper something about wasting bawbees—or was it shekels? After pickling and washing off, remove the binding-wire, and file away the surplus metal at the bottom



How to groove the valve-box

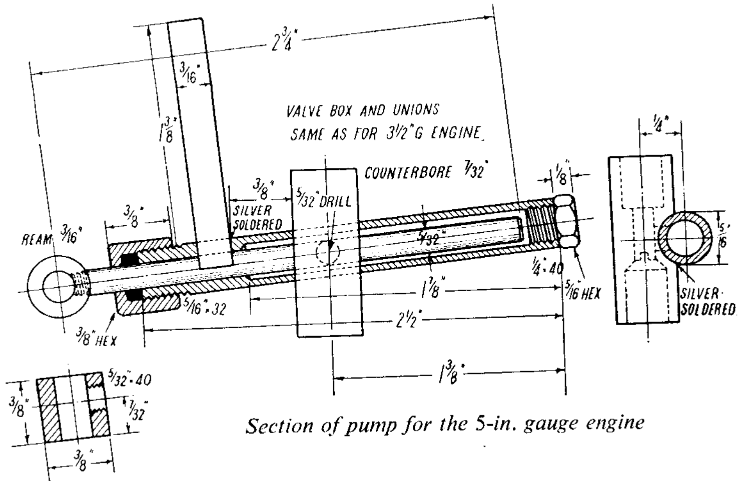
of the bracket, flush with the pump barrel, leaving the assembly as shown in the accompanying drawings.

Finishing the Job

I've described how to fit ball-valves to valve-boxes so many times, that repetition is unnecessary. Use 5/32-in. balls, rustless steel or phosphor-bronze, on $\frac{1}{8}$ in. reamed seatings. The union cap on the top of the valve-box, and the suction-valve seating at the bottom, are turned up from $\frac{3}{8}$-in. hexagon rod to the dimensions shown. The balls shouldn't have more than 1/32 in. lift, otherwise you get a "back-flow" at every forcing stroke, and the pump loses efficiency, as it doesn't put the whole contents of the barrel into the boiler. The crosshead pumps on the Stroudley *Gladstones* had six valves each, three suction and three delivery, the lift being very small; and no matter how fast the engine was running, all the water entered the boiler. As part of the exhaust steam was sent back into the tender, instead of being all blown to waste up the chimney, the feedwater got very nearly to boiling point before the journey was half completed—one reason for the low coal consumption and the good steaming—but this didn't worry the pumps in the least. The ordinary two-valve pump would have quit work as soon as the water began to steam, destroying the partial vacuum in the pump barrel.

The rams for the "Tit" pumps can be made from rustless steel or drawn phosphor-bronze rod, the smaller one needing a piece 1$\frac{15}{16}$ in. long and $\frac{1}{8}$ in. diameter, and the larger one a 2$\frac{11}{16}$ in. length of 5/32 in. diameter. Take the sharp edge off one end, and put a few threads of $\frac{1}{8}$ in. or 5/32 in. × 40, as the case may be, on the other. The driving bosses are made from round bronze or gunmetal rod, to the sizes shown in the drawings, a simple job needing no detailing out. They should be an easy fit on the crosshead pins. As there is so little hold for the threads, where the rams are screwed into the bosses, it would be advisable to silver-solder them as well.

The gland can be packed with a strand of unravelled hydraulic pump packing, or if that isn't available, graphited yarn can be used; and don't screw up the gland too tightly, for a kick-off. Pump glands need only be tight enough to prevent leakage. Some of the lesser experienced enginemen on the old "Brighton," used to screw up the glands much too tightly, when they saw a small ooze around the ram; and as the packing used at that time was just flax, or hemp, soaked in tallow, before the "patent" packings came on to the market, it set very hard, and scored the pump rams like the corrugations in corduroy trousers. On one occasion, just for curiosity, I counted the "flutes" in a badly-scored ram, and found twenty-two! The ram was only 2 in. diameter, so you can guess what its personal appearance was like.



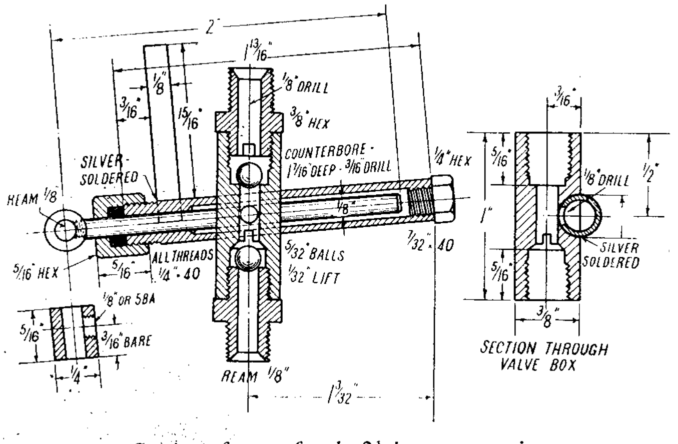
Section of pump for the 5-in. gauge engine

Erection

The erection is another simple "rule-of-thumb" job. Correspondents have moaned for many years past, about the supposed difficulty of lining up the ram of a crosshead pump with the piston-rod, so that there is no friction at the gland. Bless their hearts and souls, there's nothing to it! All I did on *Grosvenor*, was to set the crank on back dead centre, with the piston-rod fully extended, and the crosshead as near to the motion-plate as it would go. The ram was then screwed into the slide-block, and the pump barrel slid over it until the end of the ram hit the plug in the end of the barrel. The latter was then eased back 1/32 in. giving that much clearance between ram and plug. A toolmakers' cramp was used to hold the pump bracket to the frames, while I turned the wheels by hand to see if all was O.K. It was; no friction or tight place anywhere, so all that remained to be done, was to bolt the flange of the pump bracket to the frame, and Bob was my uncle.

In the present instance, the procedure is almost the same. Put the crank on back dead centre, so that the crosshead is at its nearest point to the motion plate. Push the pump ram nearly home in the barrel, and then put the whole bag of tricks temporarily in place, with the

(*Continued on page* 409)



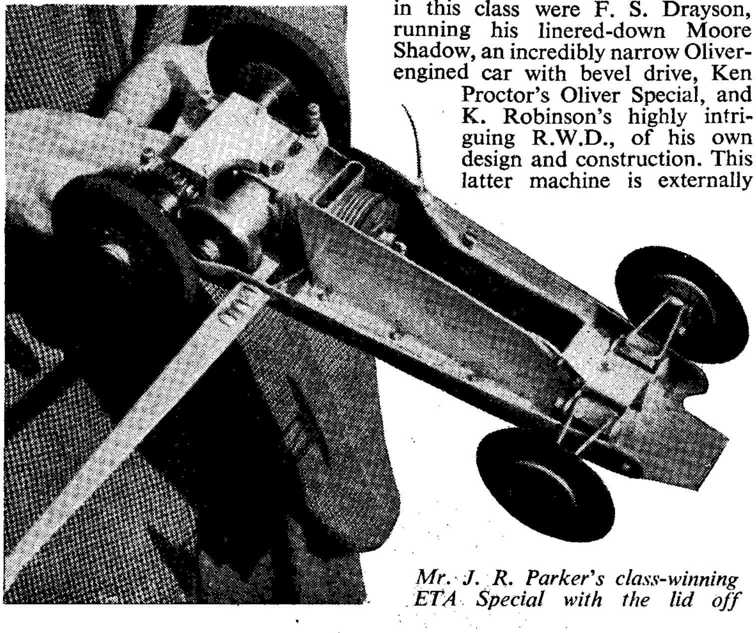
Section of pump for the 3½-in. gauge engine

Geoffrey Deason Reports on the M.C.A. NATIONAL SPEED FINALS

THE Model Car Association staged its National Speed Finals at Edmonton on a recent Sunday, the major event of the model car year in which the twelve leaders in the four recognised capacity classes fought it out over a flying quarter-mile. Finalists had progressed from area eliminating rounds, and a study of the qualifying speeds suggested unfavourable conditions in these heats, many cars having returned times well below their known maximums.

Scale fans, and those who demand some degree of realism in their models should avoid the Speed Championships, unless their nervous systems are reasonably shock-proof, for in this contest there are no holds barred, and the cars, with rare exceptions, are starkly and entirely functional. Nevertheless, there was no lack of technical interest on this account, and the more hide-bound amongst the model engineering fraternity who believe that these events are merely contests between "off the peg" American speed irons would be sadly mistaken.

The Edmonton track, which is now probably the fastest in this country, has been greatly improved by the addition of an inner apron which lessens the danger of cars running into the rough on deceleration, and the organisation of the meeting was good throughout. The first round started promptly at 1.0 p.m., with the popular 1.5 c.c. class, in which only two cars had qualified at less than 60 m.p.h.! Hot favourites in this class were F. S. Drayson, running his linered-down Moore Shadow, an incredibly narrow Oliver-engined car with bevel drive, Ken Proctor's Oliver Special, and K. Robinson's highly intriguing R.W.D., of his own design and construction. This latter machine is externally similar to B. W. Harris's 1952 Percival Marshall Trophy winner, being of "flying pencil" form, and bristling with original ideas. In cross-section, the body can be little more than 1 sq. in., this slim tube housing the Robinson-built engine with its cylinder lying along the axis. Air is admitted through the nose, and passes through ducts along the cylinder finning, carrying the exhaust gases to the rear-end orifice via a scientifically constructed internal "megaphone."



Mr. J. R. Parker's class-winning ETA Special with the lid off

Shaft induction is used, with the carburettor in the crankcase further to conserve space. The shaft bearings are buried in the wheels, the housings being of streamlined section

F. S. Drayson's "Shadow," however, proved a match for the rest of its class, its first and only run at 68.49 m.p.h. taking the class championship. The Oliver-engined cars of K. Procter, A. N. Thorneycroft and B. Griffin took the next three places, with the R.W.D. fifth at 62.93 m.p.h. A gallant lone champion of the "scale" school was Harry Howlett, of the Meteor Club, with his beautifully finished Formula 2 Maserati, with cast body, nylon-spoked wheels and Oliver power-unit.

Apart from the Medway Club's representatives, K. and A. Robinson, who were again running home-built jobs, the 2.5 c.c. class was the preserve of Oliver engines, some in more or less standard cars, and some forming the basis of "specials." Very much in the latter category was J. Dean's weird speed-model, a most unorthodox, but highly efficient means of extracting m.p.h. from a limited capacity. In this case the engine lies with head to the

rear, and drives the 1¾-in. rear wheels through reduction spur-gears running in oil. The body is in the form of top and bottom half-castings, and is of Jim Dean's own design. Although nominally rear-wheel driven, this little car runs equally happily back-end-first or upside-down! Ken Procter, of Sunderland, had entrusted his Oliver Special to club-mate F. C. Petre to run by proxy, and so well did the arrangement work that the 2.5 c.c. class was won with the first and only run at the excellent speed of 79.29 m.p.h. T. Prest's Oliver was second, and Jim Dean and K. Robinson tied for third place with their own-designed cars. The strength of the opposition can be gauged by the lowest speed in the class, 70.42 m.p.h.

In the 5 c.c. class, a bevy of American Doolings in home-constructed cars faced one home-built engine, the work of Eric Snelling of the Edmonton Club, and two British G.P. E.T.A. units in home-built cars. One of the latter, the work of J. R. S. Parker, of the Meteor (Stoke-on-Trent) Club, had already made fastest time in the eliminating trials, and there was much speculation upon its ability to defeat the formidable transatlantic engines in the final. The car bore the unmistakable stamp of "Our John," with its clean "big-car" lines, careful fairing of such tiny excrescences as the needle-valve screw, and an unusual feature, working front suspension, by transverse spring, wishbones and friction-disc dampers.

The Parker Special's most dangerous opponents seemed likely to be the Dooling engined spur-geared car, veteran of many racing miles, entered by Jack Cook of Sunderland, and Eric Snelling's very fast "teardrop" model, into which he has put so much of his tuning craft over several years. On its first outing, however, the Parker Special fulfilled its early promise by a rasping and remarkably steady run at 93.26 m.p.h., to which Jack Cook could only reply with 89.28 m.p.h., being overtopped by the Doolings of T. Prest and G. F. Wright. The Snelling "teardrop" did not complete its run, and was still further unlucky when, on its second attempt, an accident in pushing off resulted in a bent axle. Jack Cook's second run clocked 91 m.p.h., but the irrepressible John Parker put the outcome beyond all doubt by improving his astonishing first attempt to the remarkable figure of 94.14 m.p.h., which gave him a most popular victory. Undoubtedly this successful challenge to the American supremacy will give fresh heart to those who have striven so long to put the British model in the forefront.

By contrast, the 10 c.c. event lacked this exciting element despite the presence of the British record holder, Joe Riding of the Bolton Club, running his very well-prepared Rowell engined car, Snakey II. With such doughty competitors as Ian Moore, Bill Hamilton, Cyril Catchpole and W. S. Warne, speeds were obviously going to be very high, even taking into consideration the heavier regulation cable which definitely increases drag. After cracking first runs by Bill Warne's ex-Howard Frank Dooling Special, Bill Hamilton's Dooling Arrow and Ian Moore's Moore Special, also Dooling powered, with Hamilton's car fastest at 117.18 m.p.h., Cyril Catchpole electrified the meeting with a speed of 124.3 m.p.h., after which he was able to sit back and await the prize presentation with complete confidence! Of the fastest challengers, only Ian Moore was able to increase his speed fractionally in the second round. Joe Riding did well to score two runs at 104 plus, and it was pleasant to see Harry Howlett upholding the scale flag with his now elderly model Mercedes-Benz, which, however, was off-colour due to battery trouble,

"Jack the Giant Killer"! Mr J. R. Parker holding his ETA Special, which ran at 94.14 m.p.h.

Left: Mr. A. Robinson (Medway Club) at the start with his 1.5 c.c. car. One-man power starter being applied

M.C.A. NATIONAL SPEED FINALS RESULTS

1½ c.c. Class

POSITION	NAME	1st RUN	2nd RUN
1	F. S. Drayson	68.49	Scr.
2	K. Procter	59.96	66.51
3	A. N. Thorneycroft	65.07	65.69
4	B. Griffin	62.28	62.93
5	K. Robinson	62.24	60.04
6	Mrs. Wright	61.47	58.25
7	A. Robinson	60.32	60.81
8	D. M. Eaves	56.85	52.69
9	O. W. Bellamy	57.76	59.60
10	H. S. Howlett	41.39	49.72

2½ c.c. Class

POSITION	NAME	1st RUN	2nd RUN
1	K. Proctor	79.29	NR.
2	T. Prest	72.28	77.98
3	F. J. Dean (Tie)	77.05	76.27
	K. Robinson (Tie)	77.05	76.46
4	L. Williamson	76.07	70.20
5	G. A. Wright	71.54	76.01
6	F. S. Drayson	71.65	75.63
7	A. Robinson	74.56	75.12
8	P. R. Eaves	74.81	72.63
9	K. Butt	74.68	70.47
10	O. W. Bellamy	70.42	72.58

5 c.c. Class

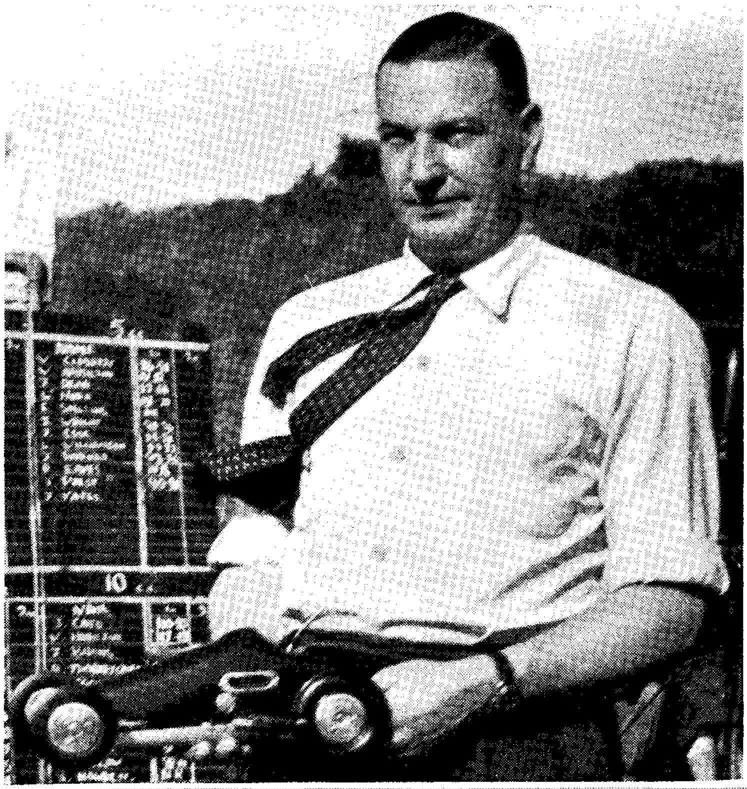
POSITION	NAME	1st RUN	2nd RUN
1	J. R. S. Parker	93.26	94.14
2	J. C. Cook	89.28	91.00
3	J. Prest	90.90	—
4	W. A. Clibbery	84.98	90.45
5	G. F. Wright	90.36	—
6	F. J. Dean	87.04	90.00
7	L. Williamson	89.37	89.46
8	W. Hamilton	—	87.37
9	W. Hurn	83.72	86.12
	D. N. Eaves	—	—
	E. Snelling	—	—

10 c.c. Class

POSITION	NAME	1st RUN	2nd RUN
1	C. M. Catchpole	124.3	—
2	W. Hamilton	117.18	115.97
3	I. W. Moore	115.23	115.68
4	W. S. Warne	112.78	105.01
5	J. Cato	110.83	110.70
6	J. C. Cook	106.76	103.44
7	A. N. Thorneycroft	106.00	102.85
8	J. W. Riding	104.40	104.98
9	H. Cook	99.55	103.68
10	J. Hadlow	98.14	—
11	L. Newbold	89.10	—
12	H. S. Howlett	—	78.32

and could only manage a little under 80 m.p.h.

E. P. Zere presented a trophy for the competitor who attained the greatest increase over the class winner in the regional trials, and this prize went to Cyril Catchpole, whose speed showed an increase of no less than 12.09 m.p.h.



Above: *Cyril Catchpole with his winning Dooling Special*

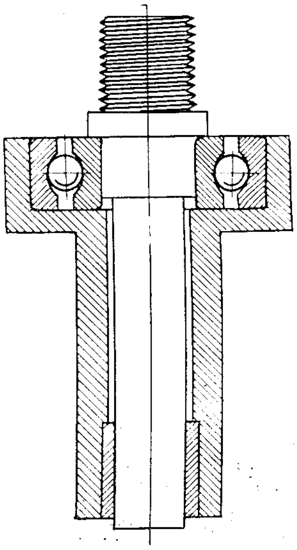
Right: *K. Robinson with his unorthodox "Flying Pencil"*

A ROTATING BRAZING HEARTH

By A. L. Primavesi

A ROTATING hearth is a most useful piece of workshop equipment. It greatly facilitates the brazing of circular joints, and is also a convenience for other brazing jobs, since all sides of the work are immediately accessible without having to move the hot work-piece or to change one's own position.

The hearth itself is the top four inches of an old domestic hot-water cylinder. Disused specimens of these can be found lying unwanted in plumbers' yards, waiting for the next visit of the scrap merchant. They are made of heavy gauge galvanised steel sheet. The top is



slightly domed, and has in the centre a screwed pipe flange, the thread of which should be in reasonably good condition. Any plumber would no doubt, for a nominal charge, allow one to cut off and take away the top of one of these cylinders. The cutting requires a little effort, but it is not too difficult if a good long hacksaw blade is used, and the cylinder is laid on its side.

The photograph shows the completed hearth, and the arrangement of the shaft and bearings can be seen from the drawing. No dimensions are given, since these will depend upon the size of the pipe flange and the ball-bearing available. The top end of the shaft is screwed to fit the flange on the hearth. Mine was done by screwcutting in the lathe, but the plumber might be persuaded either to lend his dies or to make the thread for a small charge, if the screwcutting is impracticable. The ball-race can be obtained from a garage scrap heap.

The completed hearth, when filled with coke or broken firebrick, is quite heavy, and may have to carry a heavy piece of work as well. Hence the ball-bearing must, of course, be of the type designed to take the thrust of the weight of the hearth. If such a bearing is not available, the weight of the hearth could be supported by the bottom end of the shaft resting on a large steel ball.

As regards the stand for the hearth, I was lucky enough to pick up a cast-iron pillar which was just the job. However, a stand could easily be fabricated, or the hearth could be supported on a wall bracket or a corner of the bench. It takes up very little room, and is such a useful piece of equipment that it soon justifies the small expense of time and material required to make it.

L.B.S.C's Titfield Thunderbolt

(*Continued from page* 405)

driving boss over the projecting end of the crosshead pin. The slope of the bracket, resting against the motion-plate, will automatically line up the pump barrel with the piston-rod; that is, if your workmanship is of average quality. Temporarily clamp the bracket to the motion-plate, and turn the wheels. If there is any friction, a small adjustment of the bracket should move the pump barrel enough to stop it, provided that the ram isn't slightly bent, or the workmanship what the kiddies call "worse 'n awful." When O.K. mark off the position of the screwholes on the bracket, so that the screws will go through the bit of angle attached to the motion-plate without running foul of the rivets; see illustrations showing elevation and plan. Remove the pump, drill the clearing holes in the bracket, replace the lot, and locate, drill and tap the holes in the motion-plate, for the fixing screws, by the same method I have so often described for cylinder-cover and steam-chest screws, using the holes in the pump bracket for guides. The bracket can be attached by hexagon-headed screws, or any other kind that you fancy, or may be available. Next stage, valve gear.

QUERIES AND REPLIES

"THE M.E." FREE ADVICE SERVICE. Queries from readers on matters connected with model engineering are replied to by post as promptly as possible. If considered of general interest the query and reply may also be published on this page. The following rules must, however, be complied with:

(1) Queries must be of a practical nature on subjects within the scope of this journal.
(2) Only queries which admit of a reasonably brief reply can be dealt with.
(3) Queries should not be sent under the same cover as any other communication.
(4) Queries involving the buying, selling, or valuation of models or equipment, or hypothetical queries such as examination questions, cannot be answered.
(5) A stamped addressed envelope must accompany each query.
(6) Envelopes must be marked "Query" and be addressed to THE MODEL ENGINEER, 19-20, Noel Street, London, W.1.

Petrol Burner for Marine Boiler

Please give me some advice as to how to fit up a petrol burner to fire a 6 in. × 5 in. diameter marine boiler with $1\frac{1}{4}$ in. flue. It is proposed to feed the burner from side tanks fitted into the hull, abaft the boiler, with pipes leading to a control cock below the actual burner. The feed pipe is packed with cotton wool, and leads to the jet, where the vapour is ignited. Will the head of petrol in the tanks choke it or overflow?

I have been advised that the tanks will blow up under the increasing vapour pressure. Could a safety-valve be fitted to the tanks, and what pressure should the valve be set to? Alternatively, would it be in order to take a relief pipe from the burner tube to the top of the tanks to equalise the pressure? Should the petrol tanks be lagged on the outside to keep the heat of the burner from the tanks? I propose to use petrol as a fuel, as it is a cleaner liquid, but what about lighter fluid or some other made-up kind of dope instead of commercial petrol?

Can you refer me to a design for a feed pump for this plant, and explain how the by-pass should be fitted?

J.H.B. (Bahrain, Persian Gulf).

The type of burner you propose to use is unusual, and we cannot, therefore, comment on it from personal experience, but we are extremely doubtful whether it would work satisfactorily.

In the first place, it is very doubtful whether gravity head alone would be sufficient to feed the fuel to a burner of this type. When the fuel is vaporised in a burner, there is a tendency to set up back pressure, which would force vapour into the tank, and probably upset the flow.

Petrol burners used in boats are almost invariably of the pressure type, using completely sealed tanks, o which air pressure is applied either by an incorporated pump or the application of a cycle pump to a valve in the fuel cap. The tanks shown in your sketch are not very well suited to being used as pressure tanks, though they might be suitable if strongly constructed and stayed internally. It would, however, appear quite practical to use a more conventional form of burner with a reservoir of the cylindrical type situated below it, and a burner of this type was described in the issue of *Model Ships and Power Boats* for April, 1953.

In cases where the fuel is under pressure in this way, any tendency of the fuel to vaporise in the tank through heating does not involve any danger, but if anything, is advantageous in raising the burner pressure.

Petrol is certainly a cleaner fuel to use than kerosene, but it does not produce a hotter flame, and the more volatile fuels such as lighter fluid are more difficult to deal with than petrol, while any compound fuel would probably complicate matters by reason of the different vaporising temperatures of its separate elements.

With reference to a feed pump to be driven from the engine, a pump intended for driving direct off the engine shaft of a slow-speed engine was described in the issues of *Model Ships and Power Boats*, dated May and June, 1953, and although this is intended to be used with the plunger more or less vertical, the plunger position could be modified to suit a convenient method of driving.

If the engine runs at a high speed, say more than about 700 or 800 r.p.m., it would be desirable to gear down the pump, but the gear ratio could only be determined by experiment. Some means of varying the stroke of the pump is useful in arriving at the correct output.

The pump by-pass consists simply of a leak-off cock or valve anywhere in the delivery line of the pump. In many cases this is arranged to return water to the inlet side of the pump, but sometimes it is preferred to discharge the water overboard with a visible outlet so that working of the pump can be checked.

Crankshaft Balancing

Please advise me as to the method of balancing the crankshaft of a single-cylinder petrol engine. Does the crankshaft balance by itself, or do I have to add a proportion of the weight of the big-end and bearing and the connecting-rod? If so, what proportion?

J.A. (Barnardeston).

The usual method of balancing a single-cylinder engine is to counterweight the crankshaft so that it cancels out all the unbalanced rotating weight and a portion of the reciprocating weight.

It should be noted that perfect balancing of a single-cylinder engine of the normal type is impossible, and all that can be done is to arrive at a compromise in which the effects of unbalanced forces on the structure of the engine are minimised as much as possible.

The proportion of the reciprocating weight which must be balanced out will vary to some extent according to the design and method of mounting of the engine, but it is usually in the region of about half reciprocating weight.

Sun-ray Lamp

I am making a sun-ray lamp, and have been instructed to use a 32-candle power or 50-candle power carbon lamp, mounted in an ordinary bowl fire reflector and covered by a sheet of Vita-glass or horticultural glass. Please tell me what these types of glass are, and where they can be obtained.

J.G.S. (West Malling)

With respect to carbon lamps, we presume you mean carbon filament lamps, and we are under the impression that they are no longer manufactured, though it is possible that there may be some of them in production for special purposes, such as for use as lamp resistances, and you may be able to obtain some further information by applying to the General Electric Co. Ltd., Magnet House, Kingsway, W.C.2.

The particular property of Vita-glass, is that it offers very little resistance to the passage of ultra-violet light, whereas ordinary glass tends to obstruct the ultra-violet rays. We do not see why it should be necessary to put any glass at all in a sun-ray lamp, and we may also mention that special elements for lamps of this kind can be obtained, which give a much higher efficiency than would be possible with a carbon filament lamp. These lamps could also be obtained from the General Electric Co. Ltd.

READERS' LETTERS

Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used if desired, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.

FLASH STEAM BOATS

DEAR SIR,—I am very much indebted to Mr. Pilliner for his extremely interesting and useful series on flash steamers.

Although I know very little about flash steam boats, his remarks on propellers interested me very much.

From my own experience, the thinner the blade section the more efficient they are, and this bears very little relation to the actual blade shape or section.

The propellers used on *Beta* (15 c.c.) with the propeller totally submerged were made from Spear and Jackson cabinet scraper blades. These are about 0.035 in. thick and were brazed (Sifbronze) into slots, cut at the appropriate angle, in the mild-steel boss. After modification to the drive to run as a surface propeller, these blades very soon broke off at the root.

A supply of 16-gauge steel strip of 0.6 to 0.8 per cent. carbon content was obtained. Blades tapering from $\frac{1}{16}$ in. thick at the root to 1/32 in. at the tip, made from this material also failed in a similar manner.

Except for an occasional failure, which may have been due to the blades striking floating debris rather than normal working stresses, the trouble was finally eliminated by heat-treating the blades after brazing into the boss. Of course, all twisting of the blades to give the pitch required must be carried out before heat treatment.

The treatment given consisted of oil quenching from 790-800 deg. C. followed by tempering for one hour at 400-420 deg. C. Hardness of the steel as received was 275 d.p.n. with 866 d.p.n. as quenched and 494 d.p.n. after tempering.

Owing to the low melting point of silver-solder, heat treatment of propellers whose blades are put in by this method cannot be carried out.

Heat-treated propellers made from scraper blade material, which gives hardness values similar to those above, are used on my Class "C" (10 c.c.) boats.

Yours faithfully,

Runcorn. R. E. MITCHELL.

ELECTRONIC ORGANS

DEAR SIR,—Mr. C. Clarke invites exchange of views on his electronic organ, and first I would like to compliment him on a very fine piece of design and workmanship. I would, however, urge him not to adopt a frequency tremulant, unless purely for non-musical experiment. The pitch wobble associated with "tzigane" violinists and second-rate musical comedy singers, with a modulation frequency which varies at times as much as 6 per cent., is most distressing and fatiguing to a trained ear, which subconsciously endeavours to average-out the true pitch.

If Mr. Clarke can gain access to "The Strad" March and April 1941 he will find an article dealing with vibrato in its various forms, i.e., amplitude, frequency, heterodyne and timbre, and I think this may influence him in favour of an amplitude tremulant. If he is not able to obtain a sight of these old numbers of "The Strad" I will willingly lend him a copy of the original manuscript. During some sixty years of orchestral experience I have found that players with a sensitive appreciation of intonation—especially those in the wood-wind section—have an intense distaste for frequency-modulated vocal numbers owing to the difficulty of—to use an old-fashioned word—blending; whereas quite heavily modulated amplitude vocal vibrato can be accompanied with a complete sense of sympathetic unanimity of pitch. No doubt Mr. Clarke's instrument will occasionally be used for accompanying, and frequency tremulant should never be used in such circumstances.

Yours faithfully,

Tunbridge Wells. G. E. MORTLEY.

BOILER PROTECTION

DEAR SIR,—I was interested to read in a recent issue of THE MODEL ENGINEER your reply to a query regarding the protecting of a steam boiler from corrosion when out of use. I would like to add that internal corrosion should not be a serious problem, provided the boiler is either empty and dry, or full of water, but corrosion and wasting on the fire side (assuming a coal-fired boiler) can be, and is, a serious matter.

A number of serious explosions have occurred recently with quite small industrial and farm boilers, due to this cause, and it is quite possible for serious wasting to go on undetected until the firebox collapses and ruptures, with "detriment to the crew" as the Army has it.

It is advisable, therefore, to remove the firebars and ashes and thoroughly clean the fireside as soon as the boiler is to be "laid up."

Incidentally, in an article by "Northerner" in a recent issue, he describes a vertical engine with the cylinder at the bottom as an "inverted vertical." This is incorrect, as the original steam engines had the cylinder underneath and the beam, and later the crank, on top. When the cylinder was placed on top and the crank below, this became an inverted vertical.

By the way with regard to the recent "M.E." Exhibition, when are the S.M.E.E. going to build some new locomotives? I have seen the same two (very good ones I'll admit) running for "donkey's years."

Yours faithfully,

Northants. "CHEESEHEAD."

MODEL THREE-THROW PUMP

DEAR SIR,—With reference to this exhibit, so kindly commented upon by Mr. E. T. Westbury in the issue of September 10th, the drawings were published in THE MODEL ENGINEER in August and September, 1915. The capacity is 3-gal. per min. at 100 lb. per sq. in., the revulotions per min. being 60.

The pattern making was very interesting and the only worry was the total weight when all the bits and pieces were assembled.

Although now over the three score years and ten, it is the first time I have exhibited and I am proud indeed to have gained an award.

Yours faithfully,

Croxley Green. JOHN C. SNELLING

Model Power Boat News

BY MERIDIAN

FARNBOROUGH AND SOUTHAMPTON REGATTAS

AN informal regatta was held recently at Farnborough, and arranged jointly by the Aldershot and Farnborough clubs.

The pond is very sheltered and highly suitable for speed, but on this occasion a breeze rippled the surface and this hampered the 10 c.c. boats slightly, although the heavier Class " A " craft seemed to behave well under these conditions. No special events were organised for the straight-running boats, but several well-known craft of this type were present, including Mr. R. O. Porter's *Slickery* and J. B. Skingley's *Josephine*.

Although the regatta was not a full-scale effort, there were prizes for the speed boats in the various classes, and the home clubs had gone to much trouble in order to provide tea, etc., for the visitors. Altogether, the Saturday afternoon's activities made a very pleasant occasion.

The Class " A " winner, and also winner of the Chairman's " Pot " for the highest speed of the day, was J. Benson (Blackheath) with *Orthon*, recording 66.85 m.p.h. G. Lines (Orpington) was the successful competitor in Class " B," with *Sparky* 3, this boat achieved 53.83 m.p.h., and speeded up still more after the timed laps. It looks as though the twin props now fitted are working well, after a somewhat disappointing performance when first tried.

Class " C " was won by B. Miles (S. London), with *Dragonfly* 3, at a speed of 53.55 m.p.h., and the " C " Restricted Class winner was K. Hyder (St. Albans), who recorded 60.88 m.p.h. with *Slipper* 4.

Southampton Regatta

The day following the above gathering, a regatta was held at the pond on Southampton Common, and a most interesting day rewarded those visitors who attended. For the speed fans, fine weather with no wind, and a natural pond, all made for high speed, and 60 m.p.h. was exceeded on no less than eight occasions by five of the boats entered in the racing events.

A very large entry in the straight course events, too, provided much speculation as to the possible winners, although the actual scores in the Steering Competition were

Mr. R. Phillips (South London) starting " Foz 2 "

Right: Mr. G. Lines (Orpington) starting " Big Sparky ".

somewhat low. The winner of this event was S. Fear (Cheltenham) with the cabin launch *Gyppo*, scoring three inners (9 points). Mr. J. Hood (Swindon) made a welcome appearance at this regatta and succeeded in tying for third place, with *Truant*, scoring 7 points. The other boat involved in the tie was a home club entry, Mr. Finmore's *Diana*.

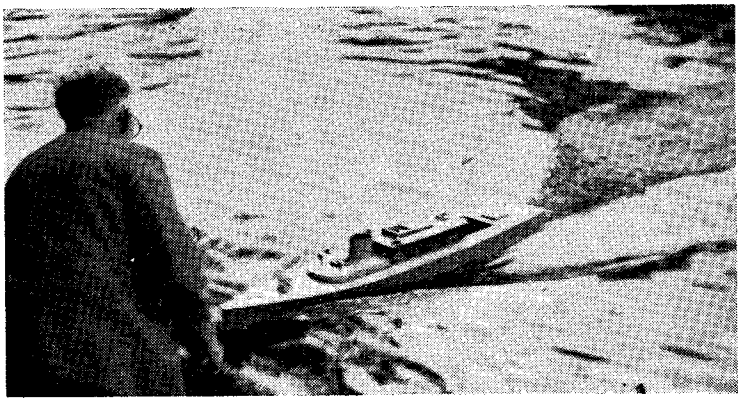
In addition to the normal programme for racing craft, there was a 1,000 yd. event open to all-comers, sufficient timekeepers being available to time an extra five laps.

The highest speed of the day, recorded in this race was by K. Hyder (St. Albans), with *Slipper* 4, at 69.81 m.p.h. The speed of this boat for the 500 yd. was a little slower—68.64 m.p.h. Another "C" Restricted boat doing well was *Nan*, by W. Everett, which recorded 66.63 m.p.h.

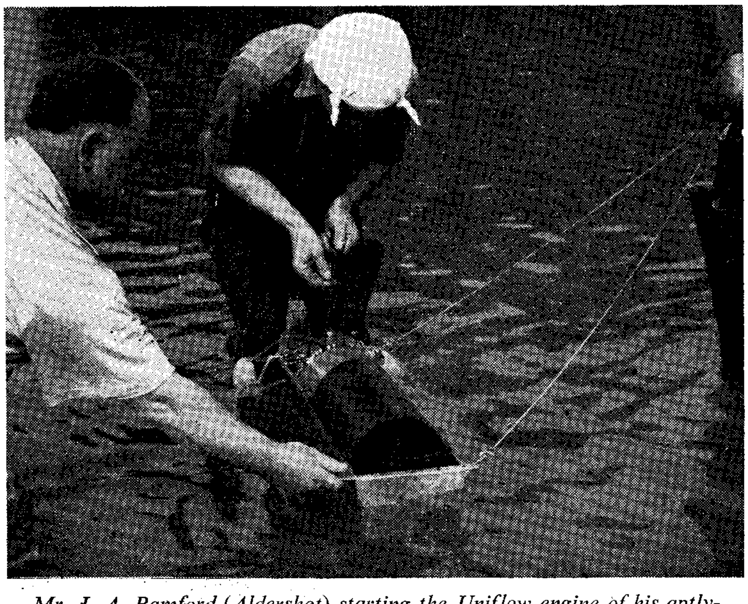
Among the home-built jobs, the best performances were by R Phillips, *Foz* 2, in Class "C" which made a run of 500 yd. at 65.99 m.p.h. and in Class "A" J. Benson's *Orthon* recorded the same speed, but over 1,000 yd. This run would have been a new Class "A" record for the distance if electrical timing had been used for the twelve laps. (Southampton course is 6 laps to 500 yd.)

B. Pilliner's flash-steamer *Eega Beeva* put up a fine run at 53.83 m.p.h., to achieve second place in the 500 yd. Class "A" race, and this represents the best regatta performance so far attained with this ingenious craft.

Some fifteen different clubs were represented at the regatta—some of them with large teams of competitors. The home club produced no less than fifteen entries, and several others had half a dozen different boats to carry their colours. The longest-distance travellers were, of course, the Bournville representatives, who never seem to miss any important regatta, wherever it may be held, and we owe a great deal to them and other provincial clubs for their continued support and enthusiasm.



Mr. W. Hood (Cheltenham) with his steam launch "Truant"



Mr. J. A. Bamford (Aldershot) starting the Uniflow engine of his aptly-named "B" class flash steamer "Hero"

Results

Nomination, 40 *yd.*

(1) A. Evans (Victoria), *Moiety*: 0.46 per cent. error.

(2) R. Cross (Southampton), *Joy*: 1.67 per cent. error.

(3) R. Robinson (W. London), *Elsie*: 2.25 per cent. error.

Steering Competition

(1) S. Fear (Cheltenham), *Gyppo*: 9 points.

(2) A. Clark (Forest Gate), *Vivien*: 8 points.

(3) J. Hood (Swindon), *Truant*: P. Finmore (Southampton), *Diana*: 7 points.

1,000 *yd. All-comers Event*

(1) K. Hyder (St. Albans) *Slipper*, 4 (CR): 69.81 m.p.h.

(2) W. Everett (Victoria), *Nan* (CR): 66.63 m.p.h.

(3) J. Benson (Blackheath), *Orthon* (A): 65.99 m.p.h.

500 *yd. Class* "D" *Race*

(1) K. Hyder (St. Albans), *Slipper* 1: 38.74 m.p.h.

500 *yd.* "*C*" *Restricted Race*

(1) K. Hyder (St. Albans), *Slipper* 4: 68.64 m.p.h.

(2) W. Everrett (Victoria), *Nan*: 63.92 m.p.h.

500 *yd. Class* "*C*" *Race*

(1) R. Phillips (S. London), *Foz* 2: 65.99 m.p.h.

(2) B. Miles (S. London), *Dragonfly* 3: 54.99 m.p.h.

500 *yd.* Class "*B*" *Race*

(1) G. Lines (Orpington), *Sparky* 3: 54.4 m.p.h.

(2) J. Bamford (Aldershot), *Jab* 3: 49.65 m.p.h.

(3) A. Martin (Southampton), *Tornado V*: 38.59 m.p.h.

500 *yd. Class* "*A*" *Race*

(1) J. Benson (Blackheath), *Orthon*: 64.73 m.p.h.

(2) B. Pilliner (Southampton), *Eega Beeva*: 53.83 m.p.h.

(3) E. Walker (Croydon), *Box o' Trix*: 40.7 m.p.h.